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The Editor's notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

The Grass and Clover Seed Industry in New Zealand

by

A. H. COCKAYNE

Biologist, Department of Agriculture, Industry and Commerce, New Zealand.

New Zealand Agriculture is not conspicuous for harvested crops. The area devoted to them is insignificant when compared with that utilized for grazing or feeding-off by stock. During the season 1913-14 less than eight hundred thousand acres out of a total of forty odd million acres that are under occupation were utilized for the production of all kinds of harvested produce, including hay. Less than one per cent of the sown grasslands are annually cut for hay, and this gives a very clear indication of the all provision that need be made in New Zealand for the production of winter feed. As, comparatively speaking, no exportation of cereals takes place, the reason for the minor position of annually harvested crops is readily explained. Of the 800 000 acres employed in their production, over 100 000, or more than 12 per cent., were devoted to grass and clover seed. Thus the growing of "pasture seeds" occupies quite an important position amongst the minor agricultural industries; in point of view of both acreage and value of production, pasture seed raising ranks third in importance (after oats and wheat) and far exceeds in value the hay crop.

Although New Zealand is eminently adapted for the successful production of all kinds of pasture seeds a large quantity is annually imported. This is due to the fact that the utilization of land purely for growing pasture seeds is rarely attempted, and unless the growing of a comparatively pure crop of any grass or clover will fulfil other functions besides that of producing a seed crop its cultivation is not entertained. The only grasses that are grown on any extended scale purely for seed production are

Crested Dogtail and Western Wolth's Ryegrass; in nearly every other case the primary object in the laying down of grassland is the securing of either temporary or permanent pasturage. Whether or not the grassland will be shut up for seed depends on the market prospects and whether the farmer intends to stock the whole of his grazing area fully during the summer. The profit to be made by temporary fattening is in most cases the deciding factor. Thus grass and clover seed raising can in New Zealand be looked upon as really a bye-product of pasture land made use of when it appears to be more profitable to let the seed mature than to lay off the growing herbage with grazing animals for the elaboration of mutton, beef or butter fat. It would thus be surmised that the main pasture seeds produced in the Dominion would be those that comprise the dominant elements of the ordinary pastures. This surmise would be quite correct. The two main grass seeds produced are those of Ryegrass and Cocksfoot which represent the two main grasses used in pasture formation and which form the dominating elements in the majority of the sown grasslands of New Zealand.

The demand for "pasture seeds" in New Zealand is large and probably no other country in the world uses a larger variety in the laying down of permanent pastures. The formation of permanent pasture is one of the most important features of New Zealand agriculture. There is no natural grassland that in any way corresponds with true pasture and the grasslands of New Zealand can be sharply divided into two classes: the natural grasslands and the sown grasslands. The former are characterized by the dominance of tall, densely tufted tussock grasses, belonging to the genera *Poa* and *Festuca*, growing at more or less regular intervals from one another and never making a compact sward capable of being mown. The sown grasslands are characterized by consisting almost entirely of European pasture grasses belonging mainly to the genera *Dactylis*, *Lolium*, *Festuca*, *Agrostis* and *Holcus*, and forming in most cases a uniform sward kept closely cropped by grazing animals. The sown grasslands comprise some 17 million acres of which about four million consist of leys with a duration of from 2 to 5 years, the remainder being permanent pasture. Each year about 6 million acres are sown down in temporary and permanent pasture, the area in the latter being steadily increased through the conversion of native vegetation, mainly forest, into grassland. As roughly over 25 pounds of seed is used per acre, the annual consumption of pasture seeds is roughly about 12 000 tons.

Although a very large variety of grasses and clovers are sown in New Zealand, only a few are grown for seed purposes in sufficient quantities to satisfy the local demand. These are the following:

1. Perennial Ryegrass (*Lolium perenne*).
2. Italian Ryegrass (*Lolium italicum*).
3. Cocksfoot (*Dactylis glomerata*).
4. Cheving's Fescue (*Festuca saburicola*).
5. Danthonia (*D. pilosa* and *D. semiannularis*).
6. Ratstail (*Sporobolus indicus*).

7. Prairie grass (*Bromus unioloides*).
8. Reed Fescue (*Festuca arundinacea*).
9. Yorkshire Fog (*Holcus lanatus*).
10. Suckling Clover (*Trifolium minus*).
11. Boyd's Clover (*Lotus angustissimus*).
12. Lucerne (*Medicago sativa*).

The following are regularly produced, but in insufficient quantity to cater for the local demand :

1. Crested Dogtail (*Cynosurus cristatus*).
2. Meadow Foxtail (*Alopecurus pratensis*).
3. Red Clover (*Trifolium pratense*).
4. White Clover (*Trifolium repens*).
5. Birdsfoot Trefoil (*Lotus uliginosus*).
6. Western Wulfs Ryegrass (*Lolium italicum* var.).

Grasses and clovers that are regularly used in the laying down of pasture but which are rarely harvested in any appreciable amounts are the following :

1. Kentucky blue grass (*Poa pratensis*).
2. *Poa trivialis*.
3. Timothy (*Phleum pratense*).
4. Sheeps Fescue (*Festuca ovina*).
5. Red Fescue (*Festuca rubra*).
6. Hard Fescue (*Festuca duriuscula*).
7. Meadow Fescue (*Festuca pratensis*).
8. Fiorin (*Agrostis alba*).
9. Red Top (*Agrostis vulgaris*).
10. Brown Top (*Agrostis canina*).
11. Paspalum (*Paspalum dilatatum*).
12. Alsike (*Trifolium hybridum*).
13. Trefoil (*Medicago lupulina*).

It will be noted that nearly all the recognised pasture grasses of Europe are under use of, with the notable exception of Tall Oat Grass (*Arrhenon elatius*) ; although fairly widely naturalized, it is not used in New Zealand agriculture.

THE MAIN PASTURE SEEDS HARVESTED.

Perennial Ryegrass. — About 50 000 acres are annually cut and sold. The majority is harvested from pastures of short duration, although a proportion is procured from permanent pastures. In many parts, especially on the east coast of the South Island, it is a regular practice to crop for a season or two with annual crops and then lay it down in Ryegrass, White and Red Clover ; it then remains in pasture until such time as it is again required for cropping and during this period several crops may be taken off. The permanent pastures of Ryegrass are mostly found in the North Island and if not required for fattening purposes a seed crop is harvested in certain cases annually. In most cases stock are exclu-

ded for about three months of the year, but in certain instances the land may be lightly stocked even after it has been decided to harvest a seed crop. The crop is generally cut with a reaper and binder, but a stripper may occasionally be employed. The yield varies from 400 to 600 pounds per acre. The land from which the seed is harvested is ordinary pasture in which Ryegrass, although dominant, is only one of the elements of the association; as no cultural methods are adopted the harvested product contains a large proportion of seeds other than Ryegrass. Thus the cleaning of the harvested seed is a very important matter and in some instances a loss of over 50 per cent. by weight is experienced in the dressing, although as a rule 25 per cent. may be looked upon as the average. The cleaning is done by power machines; in most cases rotary riddles of varying sizes are employed for removal of the extraneous seeds, and winnowing is utilized for the extraction of light seed. The bushel weight varies from 26 to 36 lbs. and 30 lbs. is looked upon as the minimum bushel weight of first-class machine-dressed seed. The germination of high-grade seed is over 90 per cent., and 75 per cent. is the average of all lines. The total crop sometimes exceeds 8 000 tons of dressed seed, and nearly the whole of this is used locally, only a comparatively small quantity being exported and that mainly to Australia.

It is difficult to determine the amount of *Italian Ryegrass* produced as there are no separate figures for this crop, but 1 000 tons would be a moderate estimate. The yield of Italian is on the whole higher than that of Perennial Ryegrass, and the bushel weight is rarely more than 23 pounds. In most cases the purity of machine-dressed seed is low, owing to the small amount of Perennial Ryegrass that is generally present in the pastures from which the seed is harvested.

Cocksfoot. — An average of 30 000 acres is annually harvested. The main quantity of seed is produced on steep hillsides on Banks Peninsula, the South Island and is termed "Akaroa" Cocksfoot. Cocksfoot is harvested by machines from level pastures of Cocksfoot and Ryegrass, but when it is termed "Plains Cocksfoot", and even after machine dressing may contain as much as 30 per cent. of Ryegrass. All the hillside Cocksfoot is threshed by hand labour and each man is paid from 1s 3d to 1s 6d per hour. The bushel weight of machine-dressed seed varies from 14 to 16 pounds, 16 lbs. being looked upon as the standard. The average yield is about 160 lbs. per acre and the loss in cleaning averages 20 per cent. Machine-dressed seed of 16 pounds bushel weight generally contains less than 3 per cent. of extraneous seeds (consisting mainly of *Holcus lanatus* and *Hypochaeris radicata*) and about 10 per cent. of empty and semi-empty husks. The germination of the pure seed averages about 84 per cent. The annual crop occasionally exceeds 2 000 tons of dressed seed. A considerable amount of Cocksfoot is exported to Europe, and for years New Zealand seed was looked upon as superior to that from any other country. At the present time, however, Danish seed is looked upon with more favour than formerly, and threatens to supersede New Zealand on the European markets unless our local seed is cleaned to a higher standard than

not adopted. The price of labour is now so high in New Zealand the margin between the cost of the undressed seed and the average for dressed seed in Europe is too small to allow of any more loss in cleaning than is now experienced.

Chewing's Fescue (*Festuca saburicola*). — About 6 000 acres are annually harvested in the southern portion of the South Island. The yield averages about 400 lbs. per acre. As Chewing's Fescue forms one of the staples of the New Zealand pasture associations, the amount of extraneous matter is not great even in undressed samples, but seed of this fescue, like other species of the genus, contains a large percentage of empty husks, thus the loss in cleaning is often very great. A large proportion of the seed is exported to Europe where it is sold under the name of New Zealand Red Fescue. The germination is generally high and when harvested under good conditions averages over 85 per cent.

PASTURE SEEDS HARVESTED IN SMALL QUANTITIES.

Besides the four grasses mentioned, a number of others are harvested in small quantities. The most important of these is *Crested Dogtail*, which is occasionally produced in sufficient amount to more than satisfy the annual local demand of about 150 tons.

Clovers are not extensively harvested and roughly about 3 000 acres are set aside for seed. The most important is *Red Clover*, nearly always sold under the name of Cowgrass, but the quantity produced is never sufficient for local requirements. The large number of species that are regularly produced but not grown for seed is peculiar, but is explained by the fact that none of them normally occupy a dominant position in any type of pasture, although the majority are generally distributed throughout the majority of the grazing land. Wherever a pasture consists mainly of a single species it may be shut up and harvested for seed; thus in certain instances grasses as Meadow Foxtail, Danthonia, Prairie grass and Reed Fescue can be harvested in quite large amounts. In very few instances, however, is the pasture laid down with the express intention of utilizing it for seed production, but the conditions being favourable for the final development of a comparatively pure association of a single species the production of a seed crop of that particular species becomes profitable and this practice is adopted.

SEED CLEANING.

There are two systems in vogue with regard to the cleaning of grass and clover seed. In the first one the merchant pays so much per pound to the farmer for his seed in the rough, *i. e.* uncleaned. In the other the merchant pays a certain price for the seed after it has been dressed and cleaned up to a specified purity and bushel weight. When seed is bought in the rough the merchant puts it through the cleaner, of which he is usually the owner, and utilizes any by-products that may result. When the merchant buys machine-dressed seed the farmer has to pay for the

cleaning and is credited with the value of any bye-products that are of commercial value. The price paid for cleaning varies with the kind of seed that is being dealt with. Ryegrass generally costs 3d for every 20 pon put through the machine, and Cocksfoot and Cheving's Fescue about 1/2d per pound, while Crested Dogtail generally averages about 1/2d per pound. The price charged for clover cleaning varies according to the purity of the seed; it has to be dressed, but 1/2d per pound is about the average price in New Zealand.

The large amount of impurities that are general in New Zealand harrowed grasses and clovers, due to the utilization of ordinary mixed seeds for their production, has necessitated the invention of many mechanical devices in order to produce a clean line. The majority of the seed-cleaning machines in use are manufactured locally and have been specially designed to suit local requirements.

BYE-PRODUCTS OF SEED CLEANING.

The main object of seed cleaning in New Zealand is the more or less total removal of all extraneous seeds. It is not unusual for many seeds to contain large quantities of extraneous seeds that have a commercial value and many of the cleanings are re-cleaned and sold. In many instances the value of the bye-products of the machine cleaning are sufficient to cover the cost of dressing the original seed, and in certain instances the bye-product may be more valuable than the seed that is being dealt with. The main grass and clover seeds of commercial value found in cleanings are as follows:

1) Yorkshire Fog (*Holcus lanatus*). — A bye-product of most seed cleanings in New Zealand. Although Yorkshire Fog is only intentionally sown in certain situations, it is a regular constituent of nearly all pastures. The covering glumes are always removed in the cleaning process and the re-cleaned article is quoted as "shelled Fog". The majority of the seed is exported to Europe and Australia.

2) Suckling Clover (*Trifolium minus*). — Like Yorkshire Fog, Suckling Clover is a regular constituent in all pastures although it is rarely intentionally sown. The seed is all exported to Europe and is most probably as an adulterant in White Clover. It is significant in this respect that the brighter the sample the more readily will it sell, while dark coloured seed, even though the germination and purity may be excellent, are comparatively unsaleable.

3) White Clover (*Trifolium repens*). — White Clover is frequently found in undressed Ryegrass seed and whenever it occurs in appreciable quantities is re-cleaned. It is generally of excellent quality and is often used in mix with imported lines to improve the colour. In certain instances undressed Ryegrass may contain as much as 25 per cent. of White Clover.

The major portion of the cleanings from New Zealand seed consists of Sorrel (*Rumex Acetosella*), Goosegrass (*Bromus hordeaceus*), Cocksfoot (*Hypochaeris radicata*) and Sweet Vernal (*Anthoxanthum odoratum*).

g certain seasons large amounts of Ergot sclerotia are removed from mass. None of these have any commercial value, although at times in of the cleanings are ground up and incorporated into stock feeds. meral, however, the majority of the cleanings are burnt.

ADULTERATION OF SEED.

Comparatively no adulteration of pasture seeds occurs in New Zealand. Certain instances Chewing's Fescue (*Festuca saburicola*) may be sold r the name of Sheep's Fescue (*Festuca ovina*) and occasionally Suckling r (*Trifolium minus*) is added to lines of White Clover. Formerly sfoot was sometimes adulterated with either Ryegrass or Chewing's ue but this practice is now rare. The mixing of different grades of same species is, however, not uncommon. This refers more particu- to Ryegrass, where a low and a high germinating line may be mixed ther in about equal amounts. There are many lines of New Zealand n grasses on the market that contain a very large percentage of ex- eous seeds, but these are in no case examples of adulteration. They ly represent seed that has not been properly dressed and has been ested from mixed pasture in which a single species, although the do- nt element of the association, may not occupy more than 70 per cent. x ground. Ordinary machine-dressed seed, with the exception of Ita- Ryegrass, however, is nearly always of high purity so far as freedom xtraneous seeds is concerned. Seed cleaning has in New Zealand been st to a fine art and the standard set by seed cleaners is so high that r as purity is concerned, machine-dressed local seed compares more i favourably with that imported.

The Present Condition of Forestry in Hungary

by

KÁROLY SCHMIDT,

Royal Counsellor for Forests and Waters.

Forest Legislation. — The forest law XXXI, of 1879, marks an impor- point in the history of Hungarian forest economy. This law, made sary by the devastation and progressive diminution of the forests een 1850 and 1870, gave wide powers to the State, though at the : time respecting the rights of private property. After the abolition ervitudes and the development of small freeholds, large extents of r fell into the hands of peasants who knew little about their manage- t, and either cleared them for cultivation or ruined them by excessive ng. At the same time the economic development which started in) and the improvement in means of transport due to railway construc- , both increased the demand for wood and facilitated heavy exploita-

tion of the forests. It was thus essential for the State to take energetic action to check the constantly increasing deforestation.

The clauses of the forest law, or *forest code*, as it may well be called, provide for the maintenance of forests in the interests of public economy. They take full consideration of the question of situation and soil, dealing with protection forests, forests on shifting sands and those on soils which cannot be profitably used for other types of cultivation (arable or grass land, gardens or vineyards). In the forests of the first type, clearing and felling are prohibited; in those of the other two types only clearing, and, further, removal of litter is prohibited in protection forests and forests on shifting sands; and in these types grazing is not allowed when it may result in damage to the trees, the young growth or the soil.

The clauses relating to rational exploitation of the forests refer to forests owned by the State, by "jurisdictions" (1), by communes, by religious bodies and by the clergy; as well as to forests under the control of special foundations and held in trust; also to "compossessoral" forests, which include those which, under the "urbairial rule" (3), have been the property of the former vassals. Lastly, these clauses are also applicable to forests belonging to limited companies founded for working or for other industrial undertakings. The forest law imposes the rational exploitation of the forests mentioned according to the plans for systematic management (Art. 17), and prohibits the employment for the purpose persons other than forest agents who have been through a special technical training (Art. 21).

The forests of the Kingdom of Hungary occupy an area of 22 113 930 acres which is 27 per cent. of the total area of the country. Of this Hungary proper with Fiume possesses 18 332 010 acres (26 per cent. of the total area), while Croatia-Slavonia contains 3 781 940 acres (35 per cent. of the total area). Under the forest law, the various forests are submitted to plans of management according to their nature as shown in Table I.

As the owners of communal and other forests could not themselves bear the expenses entailed by the plans of management without mortgaging their estates with a mortgage out of proportion to their incomes, it was necessary to make the provisions of the forest law capable of practical application. For this purpose, law XXXI of 1879 was supplemented by law XIX of 1898, by virtue of which small and large communes possessing property of an area of at least 5 000 arpents (7 110 acres) only have the right of maintaining forests at their own expense if they can include in their budgets the sums necessary for the management of the woods, if the exploitation proves profitable. If this is not the case, all these forests

(1) This is the title given to bodies, counties and free or royal boroughs which formerly had the right of holding courts of justice.

(2) A "Compossessorate" is a meeting of nobility who hold in common certain lands which remain in the family without division.

(3) This rule was established to allot to the peasants of every territory certain lands which they received either in exchange for rights of usage or by purchase from the State.

TABLE I. — *Classification of forests for management.*

	Hungary proper with Fiume — acres	Croatia- Slavonia (*) — acres
<i>ing to the type of land:</i>		
reforestation forest	744 370	88 820
forests on shifting sands	274 860	709
forests on true forest land	14 951 320	1 985 732
forests on land not confined to forest use . .	2 361 459	1 706 680
<i>ing to the ownership:</i>		
State	2 809 801	820 516
Municipalities, Communes	3 051 241	393 517
Religious bodies, the clergy	1 193 006	90 908
Public foundations	190 767	—
Private foundations	14 775	—
Trusts	1 345 130	—
Co-possessorates	2 754 736	1 469 853
Jointed companies	311 618	47 571
Total submitted to the forest law	11 671 075	2 822 374
Private property	6 660 934	959 567

* The forests of Croatia-Slavonia are submitted to the system of management established by the special law of 1894 and 1895; the regulations concerning fruition and taxation agree in essentials with those of the law XXXI of 1879.

all as those to which art. 17 of the law of 1879 refers, shall be under State Forestry Department.

For the administration of the forests, the owners are required to pay an annual tax. In 1912, the State administered 16 710 forest estates on an area of 5 058 432 acres. The taxes paid by the owners amounted to 2503 crowns (£33 021), as against 2 664 142 crowns (£111 006) for the expenses of the State.

The provisions of the above-mentioned laws, as well as the data given above, show on the one hand that these laws ensure the preservation and maintenance of forests situated on land unsuitable for other cultivation, and on the other hand that they guarantee systematic exploitation conducted by the authorities to such an extent that the forests under uncontrolled exploitation represent only a very small portion of the total area of the forests in Hungary. Considering the unsystematic exploitation of the pre-war period, this restriction was very necessary to the forestry of Hungary; however, it should continue to be so, for although as regards forest area Hungary occupies a very good position, many of the Hungarian forests contain a relatively small bulk of standing timber, and consequently cannot afford the permanent and uniform production of normal forests.

Distribution of forests and species of trees in the different parts of Hungary. — As most of the forest regions of Hungary extend along the Carpathians and their spurs, they bear the characteristics of the medium mountain types. In the northern forest region are found pine, fir, spruce and beech. The regions of the east (Eastern Hungary and

Transylvania) and the south-east, are for the most part covered with beech silver fir and oak being of less importance. The forest region of west is situated on the right bank of the Danube upon the slopes of mountains of intermediate altitude; here, the principal trees are beech oak, together with Scots pine. The region between the Danube and Tisza, i. e. the Alföld, which extends to the southern frontier of country, is the least rich in woods; here, oak and beech play only an unimportant part, and pine is almost absent; on the other hand, false acacia is found and in some places willows and poplars. In general, the forests of Hungary consist of trees belonging to the Central European flora. The respective percentages are given in Table II.

TABLE II. — *Percentage areas occupied by the different trees in Hungary*

Beech	36.11
Oaks (<i>Q. Robur</i> [<i>pedunculata</i>] and <i>Q. sessiliflora</i>) . . .	21.04
Turkey oak (<i>Q. Cerris</i>)	5.64
Spruce	14.34
Silver fir	4.31
Hornbeam	9.03
Birch	2.34
Poplars and willows	2.16
Ashes, elms, maples	1.42
False acacia	1.00
Scots pine	1.99
Larch	0.06
Alder	0.45
Limes	0.02

There are also found, although rarely, Austrian pine (*Pinus austriaca*) and stone pine (*P. Cembra*).

The area of 22 113 950 acres under forests in the Kingdom of Hungary is distributed as follows:

	Hungary proper with Fiume — acres	Croatia-Slavonia — acres
Beech and other broad-leaved trees . .	9 084 023	2 520 175
Oaks	4 872 504	831 377
Conifers	4 375 483	430 389

Hungary possesses more beech than can be profitably used. Although beech is finding increasingly wide uses, the practice has been adopted of a principles of forest economy for special cases, of substituting oak, poplar or silver fir for it.

Forest Management. — More than 65 per cent. of the forests of Hungary are high forest; the rest are coppices, of which a very small portion are standards. In some places, in consideration of the grazing rights, the system of grazing-forests has been maintained. The spruce and oak forests are mostly exploited by clear felling with artificial regeneration of the oak.

l, while in forests of silver fir and mixed forests the system of gradual obtains. In beechwoods either system is practised, according to the elements of natural regeneration. In protection forests, and in some places, in order to ensure regeneration and to guarantee the productivity of the soil, selection felling obtains. Coppice growing is practised chiefly in the smaller forests, sometimes also for the production of tan further, in the poplar and willow plantations and in *Robinia* forests cover the Alföld. In the high forests, the rotation varies between 120 years; in the coppices, between 10 and 60 years.

the work of reafforestation. — In the system of the reafforestation of which have been cleared, artificial regeneration plays an increasingly important part. The Government shows great activity in all that concerns the replanting of the communal and other forests submitted to management. Further, to assist regeneration, it encourages and subsidises the work of private individuals by means of grants, State premiums for the annual distribution of large quantities of young trees; these are granted either gratuitously or at a low price. The forest law of 1879 has established a National Forest Bank, maintained by fines for the infraction of regulations, its funds are destined, for the most part, to provide premiums and subsidies, and for carrying out useful forestry work. A considerable sum of the budget of the forests exploited by the State goes also to the creation of nurseries and to reafforestation. Further, a large sum is devoted from year to year to the regeneration of bare and eroded areas. Finally, the State, through the directions and the Treasury forest offices, as well as the foresters' offices, distribute a large number of trees for reafforestation purposes. The following data afford an illustration of what I have just said: In 1912, the State gave 30 different premiums of the value of 15 000 crowns for the reafforestation of bare land effected independently of the State. Further, 1039 poor proprietors received grants of £6 390 for reafforestation of 14 acres of bare land; four nurseries (116.4 acres) of the special forestry schools furnished 6 986 000 young trees; 186 nurseries (1360 acres) administered by the forest offices provided 64 586 000 trees. Of these trees 600 000 were distributed free to 2101 proprietors. From nurseries an area of 8.45 acres managed by the owners at their own expense, 1000 trees were used for reafforestation. Finally, 1 609 000 young trees were handed over to private individuals by the forest authorities of the Kingdom. In 1912 the areas planted were:

	acres
Land to which art. 17 of the law refers	138 218
Private land	13 522
Land not prescribed for reafforestation	6 766
Total	158 506

further 74 908 acres remained unplanted on account of unfavourable conditions, deficiency of seeds and want of labour.

In 1913, the National Forest Bank gave £2 651 8s for reafforestation. According to the budget of the communal forests, etc., a sum of £20 400

was devoted to the same object. Further, a sum of £54 000 was given for the reforestation of bare and eroded land.

We should also note that for a number of years the labours of the State in the domain of forestry, especially in that of afforestation, have been crowned with success: thus the replanting of the moving sands on the borders of the towns of Szabadka and Szeged amongst others, and the fighting of the moving sands of the Puszta Déliblât, constitute remarkable performances of Hungarian forestry and are also well known abroad.

Exploitation of forests and utilization of timber. — The timber trade on moderate sized forest estates is, for the most part, used by the proprietor for his domestic and agricultural requirements, so that only the larger estates are in a position to market timber; this not only serves to satisfy the demands of the country, but also gives rise to an export trade.

The most valuable tree is oak, furnished by the forests of Eger, Hungary, Transylvania and Slavonia; these oak woods enjoy a wide reputation. Then comes the fir of the Carpathians and Transylvania which can hold its own on the European market. As for beech wood for carpentry, its exportation, especially to Italy and Spain, is progressing increasing. The chief external trade is with Austria, whence we export large quantities of deal. In 1912 the total amount imported by Hungary was 660 800 tons, worth £1 334 000, while 1 060 700 tons, worth £346 000 were exported.

Cattle breeding being practised on a large scale in Hungary, the restriction of pasturage has often caused difficulties, especially on account of the preventive measures adopted in favour of forestry. The question has been solved, thanks to the elaboration and application of the system of grazing forests, according to which the requirements of stock-breeding can be satisfied as far as the state of the forest and its soil permit. At present most of the forests are already free from servitude and the work of clearing the properties is, to a great extent, completed.

The State forests. — In Hungary, the largest owner of forests is the State. Its forest enterprise, which has long been carried out in a systematic manner, is one of the largest of the State undertakings, and is a considerable factor in its financial resources. Also from the points of view of public and economic interest, the State forests play an important part in the forestry of the country.

Table III gives the area of the State properties in the forest according to the branches of cultivation.

The total value of the properties amounted to £9 024 in 1912. The distribution of the various trees in the State forests is given for 1912 in Table IV.

With the exception of some forests of oak and of softwood-leaved trees in the south of the country and in Slavonia which are confined to the plains, the State forests clothe the mountain districts, especially the highest zones. Above these occur alpine pastures in many districts, a greater part of the sterile ground is also found here in the rocky regions at the limits of vegetation. The alpine pastures and the meadows are

TABLE III. — *Areas of the Hungarian State properties in the forest regions (acres).*

	Build-over property	Arable land	Meadows.	Pasture	Alpine pastures	Waste land	Total of uncultivated area	Forests	Total area
any proper . . .	6 052	20 575	68 446	60 123	164 899	53 088	373 182	2 809 801	3 182 983
in Slavonia . . .	111	3 526	2 950	34 574	1 216	18 202	60 521	820 516	881 037
Totals . . .	6 163	24 101	71 396	94 697	166 115	71 290	433 703	3 630 317	4 064 020

TABLE IV. — *Area occupied by the principal trees in the State forests of Hungary in 1912 (acres).*

	Unex- ploited forests	Regularly exploited forests.					Total of regularly exploited forests
		Oak		Conifers	Beech and other hardwood broad-leaved trees	Willow, poplar and other soft- wood broad leaved trees	
		high forest	coppice				
any proper. . .	306 980	265 655	4 599	912 867	1 289 657	30 042	2 502 821
Slavonia . . .	78 128	118 956	—	90 162	531 296	1 974	742 388
Totals . . .	385 108	384 611	4 599	1 003 029	1 820 953	32 016	3 245 209

inhabitants of the respective districts. Of the alpine pastures belonging to the Treasury, about one-half are found in Maramaros county, where are established model dairies and cheese factories, which are being copied in other districts of Hungary. In the mountainous regions, trout-breeding is also practised, trout being the most important fish. Passage, letting of meadows, fisheries, shooting, the temporary agricultural exploitation of clearings, brick-making and lime burning yield at present, secondary resources of the forests, an annual revenue which may be estimated at £ 75 000, while the primary resources, which include charcoal and the production of wood for firing, carpentry and building, as well as sawn wood (beams, props and staves) bring in an annual revenue of 000 000.

According to the budget of 1912, the expenditure on the State forests was £ 752 000 and the receipts were £ 1 033 000, which gives a balance to the good of £ 258 000, or a profit of 1s 5d per acre. In previous years, under circumstances were more favourable, the budget showed profits of up to £ 290 000 to £ 375 000.

Before giving an opinion upon the results obtained in our time, it is necessary to take into consideration the fact, that it is not yet possible to realise in Hungary the intensive exploitation of forests which obtains in

Western countries; on the other hand, we must not forget that wages, the great cost of transport, patronage charges and loans given free or at a low interest, are also a heavy burden upon the State enterprise.

The timber is sold by public auction, either as it stands or in dependence as sawn timber. As wood for carpentry and builder's timber is also sold at retail, not only the large merchants, but also small traders, are able to purchase it. The retail sale is effected according to prices fixed in a tariff for forest products.

For transport, more than 6000 miles of large and small forest roads, 12 miles of waterway and 168 miles of railway are available. Much importance is now attached to the last means of transport, on account of the great distances and the large quantity of timber of enormous dimensions to be transported. The expense of the organization of means of transport, building and the purchase of real property must be estimated at £ 62 500 annuum.

The cost of the reforestation effected in 1912 on the State property is set forth in Table V.

TABLE V. — *Reforestation effected in 1912 on the State Properties.*

	Reforestation by means of			Total cost	Average cost per acre of reforestation by means of		
	natural regeneration	sowing	planting		sowing	planting	
	acres	acres	acres	£	s	d	
Hungary proper . .	4 352	1 337	24 489	31 517	9	1	25
Croatia-Slavonia . .	—	536	299	834	12	11	32
Total . .	4 352	1 873	24 788	32 351	—	—	—

In Hungary, the Treasury nurseries (857 acres) have furnished

reforestation of the State forests . . . 38 243 000 trees
 private persons 1 609 000 „
 the promotion of silkworm breeding . . 4 892 000 young mulberry trees.

Of the trees supplied, $\frac{5}{8}$ were pines and $\frac{1}{8}$ oaks and other broad-leaved trees.

In Croatia-Slavonia, the State nurseries (11 $\frac{1}{2}$ acres) yielded 701 young trees for the use of the State forests.

The Staff of the State forests consists of: 501 foresters, 87 accountants, 8 clerks, 9 doctors, 22 assistant foresters, 1391 forest rangers, 266 foremen. The number of permanent woodsmen is 2300, while other workmen number about 22 000.

Organisation of the Forest Administration. — The direction of forestry matters devolves upon the Hungarian Ministry of Agriculture, which for the accomplishment of this task has created and incorporated

large forestry sections, of which one carries out the work relating to forestry proper: viz. 1) forest inspection and administration; 2) arrangements regarding forest exploitation; 3) administration of the forest master; 4) experimental service; 5) forest statistics; 6) control of the Staff; 7) technical instruction; 8) the reforestation of denuded land. The forest section superintends all the economic and administrative business relating to the State forests situated in Hungary and Croatia-Slavonia, as well as all matters regarding the workmen, the proprietors and the game.

In order to ensure the general supervision of all the forests, the country is divided into 20 districts, at the head of each of which is placed a royal forest inspector with the necessary assistants under him. In each county has been instituted a commission of forest police, to which the forest inspector is attached in the capacity of consulting member. Matters regarding violations of forest regulations are dealt with by the administrative tribunals.

Compossessoral, communal and some other forests are administered by a forest direction with 43 forest offices, to which are subordinate 167 forestry agencies which extend their services to 91 counties and municipal boroughs. The forests of the city of Fiume are directly under the Ministry. In the Government administration are employed 294 superior and 100 subordinate functionaries, who supervise the reforestation work. The proprietors are responsible for the maintenance of the foresters. The State forests in Hungary are administered by four forest directions, four forest offices and seven other forest offices; in Croatia-Slavonia, they are administered by a forest direction, one chief forest office and one other forest office.

In conclusion we will give some information respecting instruction in forestry, the Service of forestry experiments and the part played by the National Forestry Society.

Forestry Instruction. — In 1770, the Empress Maria-Theresa founded at Selmeczbánya the Royal Academy of Mines, to which was annexed in 1807 a chair of forestry and from which there afterwards developed the Royal College of Mines and Forests. It trains foresters, for whom the course lasts over 4 years; only students possessing matriculation diplomas are admitted. After passing the leaving-examination, students must also pass a State examination in forestry preceded by two consecutive years of practical work.

During the scholastic year 1911-1912, the number of lecturers was 1, while the students numbered 405.

Lower grade forestry instruction is given in the four Royal Foresters' Schools, founded by the State between 1883 and 1893 at Királybálm, Vadászerdő, Liptóújvár and Görgényzentimre. The course lasts two years and the students are boarded. These schools give both theoretical and practical instruction. One of them has a normal supplementary course extending to the third year. The syllabus of the latter is arranged as to allow of the students being employed in the administra-

tion of small private forest estates. The teaching Staff of these four schools was in 1912: 4 directors, 4 masters, 4 assistant masters and 18 foresters. During the scholastic year 1911-1912, the number of students was 157. These four schools have administered: 9881 acres of forests, 1 acre of nurseries and 119 acres of botanical gardens.

Those persons who have received practical forestry instruction three years, and have passed the examination for forest rangers may be regarded as fully competent from the technical point of view.

In Croatia-Slavonia, in 1898, a College of Forestry with a four year course was attached to the University of Zagreb. The teaching Staff consisted of 6 special forestry lecturers, and 23 University professors and Government functionaries. The number of students in 1912 was 100. In Croatia, there is in addition a private school for forest rangers.

Service of Forestry Experiments. — In 1898, there was added to the College of Forestry a Central Station for Forestry Experiments, with four other such stations affiliated to the central one were attached to each of the Schools for Forest Rangers. These stations show great activity in all matters relating to planting, growth, conditions of cultivation, systems of management, etc. The results obtained from these experiments are published in the periodical entitled *Erdészeti Kísérletek* (Forestry Experiments).

The *National Forestry Society*, which has its seat in Budapest, founded in 1863. It possesses 2087 members (of whom 867 are original members and 1220 ordinary members). It has a library and has published for the last 53 years a bi-monthly periodical - *Erdészeti Lapok* (Forestry Leaflets). Further, it makes a grant to the professional journal *Erdő* (Forest) intended for subordinate forest officials. At the end of 1911, it had a capital of £42,072. Its aim is to increase the spread of information concerning forestry, and to guarantee the interests of foresters and assist their widows and orphans.

There are, in addition: three *Provincial Forestry Societies*, the *Forestry and Hunting Society*, and the *Society of Subordinate Forest Officials*.

In 1877, the *Forestry Society of Croatia-Slavonia* was founded at Zagreb. It now has 1405 members. This society publishes the forestry journal *Sumarski List* (Journal of Forestry) and as a supplement to the latter the *Lugarski Vijestnik* (Foresters' Communications). At the end of 1911, its capital amounted to £7856.

Report on the Poultry Industry in South Australia

by

D. F. LAURIE,

Poultry Expert & Lecturer.

From the earliest days of the founding of this State, poultry keeping has formed a by no means inconsiderable branch of rural industries. It was soon found that the equable climate and general conditions were

able to all breeds and varieties of domestic poultry. Various imitations of different breeds were made from time to time until in due time the newest breeds and varieties evolved in other countries were represented here. The fancier was primarily responsible for the introduction of the various breeds, and very soon poultry societies and shows were organised. At the present time there is one Metropolitan Society, in addition to which the Royal Agricultural and Horticultural Society does its best to encourage the poultry fanciers, and provides numerous classes for the shows. In the country districts are numerous poultry societies, and Agricultural Societies which provide classes for poultry at their annual shows. Specialist clubs attend more particularly to the welfare of several of the prominent breeds.

The poultry fanciers as a rule are not large breeders, and few breed more than two hundred chickens in a year. Farmers throughout the State keep flocks varying in numbers from one to five hundred. The utility flocks, collectively, are becoming an important factor in this State, and of them breed from one to five thousand or more chickens in a season. At the present time there is a general move in the direction of larger plants, and several are in operation which will shortly provide for several thousand and the production annually of many thousands of chickens. Egg production is receiving more attention than flesh production, as the general opinion is that the former is the more certain, and also the more profitable on a small ranch.

Among the utility breeders for egg production the White Leghorn (Australian type) is the most popular. There are a few who breed Minors, Brown Leghorns, and laying strains of Orpingtons, Langshans, Wyandottes. The all round breeds such as Orpingtons and Wyandottes, Langshans, and Plymouth Rocks are bred in fair numbers and there is every evidence that there will shortly be a great revival in these, or at least some of them.

Imports. — No poultry or eggs for human consumption are imported into this State. Poultry breeders import on the average about a thousand of various breeds from the other States, and overseas, for breeding purposes. They also obtain from the other States annually a few hundred sets of eggs for hatching.

Exports. — Shipments of eggs in cold storage have been successfully made to England. Each year some thousands of chickens and ducklings have also been shipped to England where they realised excellent prices. At the present time the great prosperity and rapidly increasing population of the Australian States result in excellent markets for all our available poultry. Increased prosperity and large demand have resulted in very materially improved prices, so that the prospects of the overseas trade, as at present, are not so enticing as they were. The annual value of eggs and poultry sent to the other Australian States is over £ 150 000, and the total value of the poultry products of this State is £ 750 000. While the growth of the industry has been satisfactory as regards quantity, the increased value is largely due to the higher prices obtained for the products.

TABLE I.

		No. of Hens.	Eggs Laid.
1st Test, held at Magill	1903-04	156	20 630
2nd " " Roseworthy	1904-05	186	21 701
3rd " " "	1905-06	186	31 962
4th " " "	1907-08	450	80 959
5th " " "	1908-09	336	63 818
6th " " "	1909-10	678	126 133
7th " " "	1910-11	534	102 723
8th " " "	1911-12	756	133 093
9th " " "	1912-13	804	146 329

Large numbers of high class stock are sent to the adjoining States, Zealand, South Africa, America, India, and other parts.

Prospects of the industry. — There is no branch of rural activity can offer to the producers of this State a more satisfactory prospect regards markets. Not only are the interstate markets satisfactory likely to continue, but in addition the general shortage in the World: plies of eggs and table poultry affords markets in England and on the continent, which will be available for profitable exploitation in the near future.

Government Assistance. — Seventeen years ago the Government the day was struck by the possibilities of the industry. An expert breeder and expert was appointed to lecture in the country district to write pamphlets and articles and to take steps to promote the breeding of poultry on commercial lines. Grants of money were made to various poultry and agricultural societies to provide prizes to encourage breeding of certain specified breeds of poultry.

Exhibits of an instructive nature were organised, and staged at metropolitan and the chief country agricultural shows. These exhibits demonstrated the best methods of packing eggs and poultry for export. Principal foods, with their uses and feeding values, were shown, together with a mass of valuable information in statistical form easily understood. In connection with the export trade to England the State made advances on both eggs and poultry shipped, in addition to undertaking grading, packing and shipping of eggs, and the killing, preparation, grading and packing of table poultry, also the sale in England.

The Poultry Section of the Department of Agriculture is organised as follows:

The Poultry Expert & Lecturer is officer-in-charge, assisted by two Inspectors. Correspondence, which includes a large amount of instruction, the designing of poultry plants for breeders, investigation

Prices of Tests.

Paid by No. Pen.	Market Value			Cost of Food per Hen.		Return per Hen.		Profit per Hen.		Average Price of Eggs per Doz.
	£	s.	d.	s.	d.	s.	d.	s.	d.	
32	77	7	8	7	9	9	11	2	2	10.8
51	58	7	4	3	1	6	3 ¼	3	2	7.74
43	98	10	11	4	11	10	7	5	8	8.8
31	273	0	0	5	4 ½	11	10	6	5 ½	9.8
47	232	19	10	5	9 ¾	13	10	8	0 ¾	11.09
31	470	12	5	5	6 ½	13	10	8	3 ½	11.54
13	358	17	8.9	5	10 ½	13	5	7	6 ½	11.2
89	545	6	2.7	4	11 ½	14	4 ¾	9	5 ¾	11.8
13	663	11	2	5	7.8	16	6	10	10.2	13.06

eases, the inspection of poultry yards under the Stock Diseases Act, carried out from the Adelaide Office.

The Expert lectures at various country centres in connection with local Agricultural Bureaux and Agricultural and other societies. He also lectures at the Agricultural College, Roseworthy, and gives annual courses at the School of Mines & Industries. Personal visits of inspection and to impart advice on the spot are paid by the Expert and spectators. Beginners are supplied with plans of buildings, the erection of which is supervised; and, if required, all operations are overlooked.

Publications. — Through the Departmental Journal of Agriculture orders are supplied each month with information contained in seasonal notes, general and special articles. Much time is given to original research on diseases and parasites and the results are published in the Journal and in Bulletin form. A "Poultry Manual" (now in the third edition) is on sale at a nominal price. All other publications, including an extensive Annual Report and Bulletin on the Egg Laying Competitions, are distributed gratis.

Poultry Experiment Station. — Until recently there were three Poultry Stations, one at Roseworthy, on the Agricultural College grounds, one at Murray Bridge, and one at Kybybolite, in the south east part of the State.

It was deemed desirable, for many reasons, to concentrate all work at one centre and a new site was chosen at Parafield, near Salisbury. Parafield was formerly a wheat-breeding station and consists of 100 acres of first-class wheat land, but rather heavy for poultry. The distance from Adelaide is only 11 miles by rail and about 10 miles by road. Here will be assembled, with many additions, the dismantled poultry stations removed from the old sites. The accommodation now in course of provision will include a block of 160 pens for the Laying Competition, yards and

houses to accommodate 5000 laying hens, and 150 pens of breeding stock with chicken-rearing yards to accommodate 10 000 to 12 000 chickens. There are two incubator rooms fitted with Cypher's hot-air machines of 40 egg capacity. Two brooder houses each 100 ft. long are provided, and the brooders and incubators are heated by an air gas (gasoline) plant, which will save labour and obviate many disabilities. Food stores, and distributing houses, workshops, stables, etc., are also in course of erection. Water is laid on to all buildings and pens. The whole of the land will be under cultivation, and considerable areas of lucerne and other fodder crops will be grown under irrigation.

In addition to the Laying Competition it is intended to organise Single Testing Competitions. Each competitor will enter 6 pullets, each of which will be confined in a small house and run: this is a more accurate and scientific method than trap nesting. Food tests will be carried out and many problems connected with incubation, breeding, etc. will be dealt with. It is intended to accommodate sufficient laying hens to provide sufficient revenue to make the Station self supporting.

The education value of this easily accessible Poultry Station will be very great.

Later on provision will be made for students and also for the delivery of short lectures to the public on visiting days. The present staff consists of seven assistants, Assistant Superintendent, Superintendent and two farm hands. In addition to the 930 competition birds there are 50 pens of breeding stock and about 2000 layers. The breeds are White Leghorn and American Barred Plymouth Rocks. Later on some other breeds will be stocked.

The Laying Competition. — The results of the South Australian State controlled Laying Competitions have attracted attention throughout the world. The object of these tests is to demonstrate that it pays to breed good strains of layers and also to house and feed them properly. The three important considerations are not always understood, nor is the true value recognised.

Table I (pp. 1402-1403) shows the results of the Competitions hitherto held.

The current test 1913-14 consists of 154 pens, the largest number ever gathered in one test.

There are three sections: Sec. 1. Light Breeds; Sec. 2. Heavy Breed; Sec. 3. Pens entered by Farmers, Pastoralists, Fruit and Vegetable growers.

The egg production in the first three months is satisfactory and the result is every prospect that the final result will uphold the great reputation of the fowls of this State.

EXPERIMENTAL AND RESEARCH WORK.

Feeding poultry for egg production. — During recent years continuous feeding tests have been carried out at the Poultry Stations in connection with the Egg Laying Competitions, which are organised by the Department of Agriculture.

Pen.	How Fed.	Month.												Total.
		June	July	August	September	October	November	December	January	February	March	April	May	
1	Morning. — Mash, ground rye, wheat, bran, meat meal.	89	63	94	82	187	151	105	129	50	132	66	161	184
	Midday. — Green feed.													
	Evening. — Rye, grain in litter.													
2	Morning. — Mash, oat flour, wheat, bran, meat meal.	101	116	104	107	133	153	107	178	71	172	70	51	317
	Midday. — Green feed.													
	Evening. — Oats in litter.													
3	Night & Morning. — Mixed grain.													
	Midday. — Green feed.	82	104	147	130	169	123	93	128	63	101	10	41	154
	Morning. — Grain.													
4	Midday. — Green feed.	93	108	128	99	161	122	112	163	102	108	25	41	225
	Night. — Competition mash.													
	Morning. — Half competition mash, half grain.													
5	Midday. — Green feed.	62	83	139	91	160	112	93	150	44	108	55	111	108
	Evening. — Same as morning.													
	Dry competition mash continuously in hopper.													
6	Midday. — Green feed.	45	62	69	53	125	77	90	98	61	71	78	24	853
	Evening. — Grain in litter.													
	Morning. — Competition mash.													
7	Midday. — Green feed.	44	32	74	67	158	180	133	125	70	122	67	191	1091
	Evening. — Grain in litter.													
	Morning. — Competition mash with double meat.													
8	Midday. — Green feed.	60	43	94	97	145	187	157	144	76	124	58	111	196
	Evening. — Grain in litter.													
Total . . .		576	611	849	726	1238	1105	890	1115	537	958	429	949	128

TABLE III.

Breed	Total Number Eggs Laid for March.	Total Number Eggs Laid for Year.	Average per Pen.	Average per Hen.	Standard Dev.
Black Orpington	140	3 495	699	116.5	
Silver Wyandotte	392	4 930	986	164.3	
White Leghorn	273	5 515	1 103	183.8	

TABLE IV. — *Egg production of various breeds.*

Number of Pens	Number of Birds	Breeds.	Total	Average per Pen	Standard Dev.
65	390	White Leghorn	77 523	1 192.67	
19	114	Black Orpington	20 045	1 055.2	
4	24	Buff Orpington	3 940	985.2	
2	12	White Orpington	1 582	791	
5	30	Silver Wyandotte	5 500	1 100	
4	24	White Wyandotte	3 777	944.25	
3	18	S. C. Brown Leghorn	3 012	1 004	
2	12	R. C. Brown Leghorn	1 987	993.5	
2	12	Minorca	1 915	957.5	
2	12	Langshan	2 106	1 053	
1	6	Black Leghorn	964	964	
1	6	Buff Leghorn	738	738	
1	6	Ancona	1 000	1 000	
1	6	Andalusian	961	961	
1	6	Plymouth Rock	1 069	1 069	

Throughout the series the feeding has been only slightly varied as follows:

7 a. m. — Mash, a mixture made as follows: bran 1 part by weight is scalded over night generally with soup made from meat meal; it is mixed with pollard two parts, and worked to a crumbly mass. Some lucerne hay chaff, in the proportion of about one third of the bulk, is added. At noon a supply of cut green food is fed, and in the evening a supply of grain, which is generally wheat. In cold weather maize, oats, and beans are fed occasionally.

It may be added that the birds are confined in yards 10 feet wide

TABLE V. — *Fertility Test* (Male bird removed Dec. 12).

Date Eggs Laid	Eggs set.	Fertile	Infertile.	Per Cent.
1911				
Dec 12th	10	10	—	100
13th	10	10	—	100
14th	10	10	—	100
15th	10	9	1	90
16th	10	10	—	100
17th	9	7	2	77
18th	10	9	1	90
19th	10	9	1	90
20th	10	8	2	80
21st	10	7	3	70
22nd	6	3	3	50
23rd	7	3	4	42
24th	6	3	3	50
25th	10	2	8	20
26th	7	—	7	—
27th	10	2	8	20
28th	10	1	9	10
29th	10	—	10	—
30th	10	—	10	—
31st	9	—	9	—
1912				
1st	10	—	10	—
2nd	10	—	10	—
3rd	10	—	10	—
4th	10	—	10	—

long, with a house at one end. The yard is floored with scratching

sting various foods. — To test various foods and methods of feeding, fully selected White Leghorn pullets were divided into flocks of 10 housed and yarded under similar conditions.

ble II (p. 1405) shows the results.

red tests. — A further test extending over 12 months was made. test 30 carefully selected pullets of each of three breeds were

The results are shown in Table III.

the various detailed reports of the Egg Laying Competitions the of the egg production of each breed represented have been tabulated.

TABLE VI. — *Weights and Measurements of Eggs and Shells.*

No	Breed	Weight gms.	Length, Long Diameter cm.	Breadth, Short Diameter cm.	Thickness of Shell				Weight of Shell gms.	Weight of Shell as percentage of egg	Color and Appearance of Shell
					Large End	Small End.	Middle	Average			
					mm.	mm.	mm.	mm.			
1	Black Orpington	66.95	6.16	4.43	0.371	0.423	0.413	0.402	0.423	8.53	Brown, good, large
2	Black Orpington	52.15	5.41	4.13	0.512	0.431	0.394	0.445	6.21	11.90	Tinted, good, medium
3	Buff Orpington	62.75	5.91	4.26	0.561	0.441	0.391	0.501	7.38	11.60	Brown, good, large
4	Buff Orpington	51.65	5.63	4.11	0.392	0.472	0.421	0.428	6.39	12.37	Brown, good, medium
5	White Orpington	60.87	5.89	4.21	0.399	0.423	0.422	0.414	7.18	11.79	Brown, good, medium
6	Plymouth Rock	71.85	6.09	4.59	0.451	0.432	0.549	0.477	8.08	11.24	Brown, good, large
7	Plymouth Rock	58.25	5.52	5.29	0.442	0.473	0.448	0.454	7.68	13.18	Brown (dark), large
8	Silver Wyandotte	62.86	5.78	4.37	0.439	0.489	0.458	0.462	7.15	11.37	Tinted brown, large
9	Silver Wyandotte	47.15	5.21	3.98	0.472	0.451	0.423	0.448	6.18	13.10	Tinted brown, small
10	Langshan	61.55	5.77	4.32	0.423	0.381	0.458	0.420	6.54	10.62	Brown, large
11	Langshan	58.41	5.62	4.29	0.451	0.481	0.379	0.437	6.93	11.86	Brown, medium
12	White Leghorn	75.65	6.18	4.71	0.466	0.451	0.442	0.453	8.63	11.40	White, large
13	White Leghorn	57.37	6.11	4.18	0.399	0.393	0.392	0.394	6.29	10.96	White, medium
14	Black Minorca	73.16	6.05	4.67	0.445	0.448	0.549	0.486	8.92	12.19	White, large
15	Black Minorca	68.75	6.02	4.45	0.431	0.573	0.511	0.505	8.14	11.81	White, large

Table IV (p. 1406) is representative of this and concerns a number of different breeds and varieties.

Fertility test. — At the close of the breeding season a test was carried out to ascertain how long after the removal of the male bird from the breeding pens the eggs laid would be fertile. The result is shown in Table V (p. 1407).

These Tests were confirmed on other occasions.

Weights and measurements of eggs of various Breeds of Fowls. — An average eggs of fifteen different breeds and varieties of fowls were selected and carefully measured and weighed. Table VI shows the results.

Loss of weight in eggs during incubation. — Numerous experiments have been made. Careful records have been tabulated of the temperatures and moisture content of the air of the incubator rooms and of the incubators. Hot-water heated and hot-air heated machines were used. The average loss of weight per egg was found to be: hot-air machines, 16.24 per cent; hot-water machines, 15.78 per cent.

Flesh production. — Among other tests certain pure breeds and crosses were selected and fed with a cramming machine. The results are as follows:

Breed	Average increase per bird.	
Indian Game crossed S. Wyandotte	2 lbs.	1 oz.
Buff Orpington	1 "	5 ½ "
White Wyandotte crossed O. E. Game . . .	1 "	5 "
Indian Game crossed Dorking	1 "	2 "
Black Orpington	1 "	2 "
White Leghorn		14 ½ "
Faverolles		15 ½ "

Investigating diseases of poultry. — Most diseases of poultry are due to the presence of ecto and endo parasites. The following are met with and have at various times been the subject of investigation.

Parasite.	Disease caused
<i>Argas persicus</i>	Spirochaetosis
<i>Goniodes</i> sp.	Phthiriasis.
<i>Goniocotes</i>	Are probably carriers of spirochaete and other endoparasites.
<i>Menopon</i>	
<i>Lipeurus</i>	
<i>Dermanissus gallinae</i>	Coccidiosis in fowls and turkeys. Little Chick Cholera.
<i>Coccidium atium (gallinae)</i>	
<i>Nematoda (Heterakis sp.)</i>	Malnutrition, arrested metabolism and septicaemia.
Taeniae	Taeniasis.
<i>Demodex</i>	Itch, etc.
<i>Sarcoptes</i>	Scaly leg.
<i>Lophophyton</i>	Lophophytosis (Favus).

Various diseases, such as roup (generally due to invasions of *Bacillus diphtheriae gallinae*) and chicken pox (due to a fungoid parasite), are commonly met with and have been carefully studied. Preventive measures in all cases are advised as the only scientific method as regards successful poultry culture. Bulletins on some of the above parasites have been published and others will appear in due course.

Work of the Entomological Section of the Swedish Central Agricultural Experiment Station, during the Years 1907-14.

by

Prof. ALBERT TULLGREN,

Director of the Section.

The Entomological Section has had from the beginning a twofold aim. On the one hand it gives the public advice and information on questions connected with agriculture and kindred industries, and on the other hand it works at the theoretical and practical solution of certain problems of economic importance, such as the life history of animal pests and the means of controlling them.

This latter field of activity should naturally be the most important for the Section, as the scientific and practical solution of the problems connected with animal pests forms the necessary basis for really useful advisory work; nevertheless the actual state of things is quite different owing to several obstacles which have hitherto been unsurmountable. During the period 1907-14 the Section has, in the first place, accomplished a vast amount of informatory work. The public has availed itself of this privilege in a large measure; the Section endeavours at the same time to keep in close touch with farmers by means of correspondence and diffusion of articles drawn up in a popular form. There is no doubt that these efforts have been attended by much success, as is proved by the fact that among others, that the control of the commonest animal pests -- at least in the domain of horticulture -- has become, of late years, more general and more intense.

One of the factors of the informatory work of the Section -- a factor which also favours to a great extent practical and scientific research -- is the service started in 1911 which has taken the name of Intelligent Service. Its chief object is to supply a certain, and if possible, complete knowledge of the distribution, frequency and life-history of injurious animals in Sweden, as well as the value of the means of control, etc.

There are in different parts of the country about 500 persons ready, according to their culture and available time, to transmit at certain periods reports on the animal pests of their districts. These reports include

by the animals which injure field crops, but also those which cause damage to gardens, orchards, and forests. All these reporters have the advantage of being entitled to send their correspondence and samples post paid.

The Intelligence Service has, as has been said above, two advantages. On the one hand it facilitates the relations between the Section and the public, and on the other it supplies the Section with considerable material for study. By means of the correspondence and research work on the samples sent in, the Section endeavours to determine, as far as possible, the exactness of the communications received. The reporter who has taken part in this work for some years and has become interested in it acquires a relatively good knowledge concerning the commonest animal pests and may in his turn supply information. The Section has already gained a good deal from the reports that it has received. Thus, for instance, the knowledge on the distribution and life-history of *Argyresthia conjugella* Zell. and of *Aphis padi* L. has been enriched by precious contributions.

As regards the scientific activity of the Section, it may be stated that as illustrated, in its principal publications, the life-history of many various animals of importance to Sweden. One of the insects most injurious to fruit trees in the country, the above-mentioned *A. conjugella*, especially been the object of diligent study. The results of these investigations have been published in the "Communications" of the Central Institute. For several years past the aphides of Sweden have been studied with the greatest care. The first part of a monograph on them was finished in 1909. Of late years the life-history of several Tenthredinids has been likewise studied. To these works must be added researches on wood-boring Lepidoptera, and Colcoptera (such as the larvae of Curculionidae and of Halticinae) of importance from an economic point of view. Some of the results obtained have also been published in our "Communications".

As for the practical and experimental work, the following deserves special mention. A vast series of investigations has been carried out in the matter of the utility of carbolineum in horticulture. The result of these investigations has been that spring spraying with 8 to 10 per cent emulsions has been proved to be extraordinarily efficient against several animal pests, such as apple sucker (*Psylla mali* L.), pear-leaf blister mite (*Aspidiotus pyri* Pagst.) and numerous scale-insects. On the other hand it has been ascertained that against fungi the utility of carbolineum is very limited, and that in certain cases it may prove fatal to plants.

Numerous experiments have also been made with lime-sulphur washes, partly to check results obtained abroad and partly to increase our knowledge regarding this important means of control.

Among arsenical compounds used in sprays, only Paris green and arsenate of lead were experimented on a large scale. Good results against the animal pests of Cruciferae have been obtained by adding to the wash substances capable of increasing its adhesiveness, such as gelatine.

Besides the above-mentioned sprays, the Section submitted to critical examination a great number of other products, including two English preparations for the disinfection of the soil: "Vaporite" and "Apterte". But all these investigations yielded almost exclusively negative results.

Among the injurious animals — which of late years have attracted special attention — the following deserve to be mentioned: winter moth (*Cheimatobia brumata* L.), codling moth (*Carpocapsa pomonella* L.), *Adresthia conjugella* Zell., apple sucker (*Psylla mali* L.), pear-leaf blister mite (*Eriophyes piri* Pagst.), *Agriotes* sp., *Phyllotreta* sp., *Hallica* sp., *Pissonotus cochleariae* Fabr., *Hyponomeuta* sp., *Coleophora loricella* Hbn., *Tetralix* sp., *Bryobia praetiosa* C. L. Koch.

The efforts of the Section to improve its material position also form a part of its work. Its desires have been to a great extent realized of late years. In 1913 a new building for the Institute was erected; it is spacious and arranged in the most modern manner to meet the requirements of practical and scientific experiments. A remarkable collection of preparations illustrating the cycle of development and the habits of our principal enemies, an important collection of photographs, and a rich library may also be considered as, to a great extent, the result of our activity during recent years.

SECOND PART. ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

Encouragement of Olive Growing and Fruit Growing in Tripolitania. — *Decreto*
(Gazzetta del Regno, Tripoli, August 6, 1914.

In the suggestion of the Director of the " Ufficio Agrario " of Tripoli, growers shall be entitled to a grant of 4 *d* for each properly grown young plant obtained from seed or from cuttings and 2½ *d* for every almond per fruit tree grafted. The " Ufficio Agrario " is authorised to distribute a suitable number of olive plants (" ovoli " or cuttings) and grafted trees to growers who apply for them and give the assurance that they will undertake to cultivate them according to the recognized agricultural practice.

Agriculture in Réunion. — *Ministère des Colonies Bulletin de l'Office colonial*, No. 7, No. 78, pp. 300-309. Melun, June 1914.

The island of Réunion has an area of 970 sq. miles. It is essentially volcanic and is divided into two groups of mountains joined on the south by the Plaine des Cafres and on the north-east by the Plaine des Mamelles.

Réunion is an essentially agricultural country; plants from all parts of the tropics flourish in the littoral zone and those from temperate regions in the mountainous interior. All the land is available to cultivation except the forest reserves established in 1874, which comprise nearly 100,000 acres. The remaining portion is distributed as follows:

	sq. miles
Coast zone suitable for cultivation	390
Cultivable area in the cirques and islets	75
Area unsuitable for cultivation	115

Soils. — The soils consist of volcanic matter in different degrees of disintegration, the process being most advanced in those of the north-eastern mountain group, where also the deepest sediments occur. They are characterised by a low percentage of lime and potash, probably due to leaching.

Climate. — Two types of climate prevail: one in the east, extending from St. Joseph to St. André with a rainfall of 2300 mm. (90 in.) and the other with a rainfall of scarcely 900 mm. (36 inches). There are two distinct seasons: the cool season from May to October with a minimum mean monthly temperature of 21.15° C. (July); the warm season from October to April with a maximum mean monthly temperature of 27.5° C. (February). The only danger to crops is from cyclones, which often lower the yield by 20 to 40 per cent.

Agricultural Position in 1892 and 1912.

Area cultivated	In 1892	In 1912
	acres	acres
Sugarcane	72 000	47 000
Vanilla	1 680	1 350
Coffee	3 830	2 970
Cacao	62	86
Cloves (isolated trees)	area undetermined	
Tobacco	865	1 240
Manioc	3 880	8 650
Aromatic plants	740	4 000
Maize	37 000	50 000
Fallow, bare or cropped	50 000	37 000
Various crops, potatoes, orchards, vegetables, gardens	15 000	12 500
<i>Exports.</i>		
Sugar tons	37 800	37 960
Vanilla lbs.	212 235	148 051
Coffee "	426 191	30 515
Cacao "	1 883	1 378
Cloves "	2 930	309
Tobacco "	83 319	247 846
Essential oils "	23 732	103 593
Rum gallons	370 026	774 772
Tapioca and starch tons	654	2 037
Dried manioc "	—	242
Choco (<i>Secchium edule</i>) lbs.	—	108 097
Spirits from sugar cane gallons	—	51 328
<i>Fourcroya gigantea</i> fibre tons	—	202
Preserved fruits lbs.	—	21 475

The total value of the exports of the chief agricultural products was estimated at £578 000 in 1892 and £645 000 in 1912; it should be noted that in the latter year the price of sugar was very low: 9s 10s 6d per cwt.

rice of land. — The average value per acre varies from £16 to £64 according to the locality, and it has not appreciably varied during the 30 years.

Sugarcane. — This crop covers about a quarter of the cultivated area. From 1870 to 1912 the annual production varied between 20 000 and 30 000 tons, reaching a maximum of 46 000 tons in 1895. Some richer varieties have recently been introduced and propagated, viz.: Bigtanna, Sabilla, Cristalline, No. 100, etc. Under good cultivation they yield 19 per cent. of sugar. Chemical manures are in common use, and bigger yields being obtained. The factories provided with roller mills and defibrators obtain from 1500 to 1550 lbs. of juice per ton of cane.

Vanilla. — The average yield from 1892 to 1912 was about 70 tons, reaching a maximum of 200 tons in 1898. The crop gives excellent results on the island, but has suffered considerably from recent cyclones.

Coffee. — The yield of coffee has fluctuated considerably between 1892 and 1912. The exports have fallen from 426 190 lbs. in 1892 to 305 150 lbs. in 1900 and 30 515 lbs. in 1912. This is coincident with a fresh attack of *Hemileia* in 1900, which was successfully treated with copper sulphate, but in 1902 occurred an outbreak of *Lecanium viride*, introduced from Mauritius and Ceylon. New species have been introduced, but the growers prefer the old types, *arabica* or round coffee and *roy* or pointed

aromatic plants. — The cultivation of these plants has increased considerably during the last 20 years. In 1892, 23 732 lbs. of essence of ylang-ylang, valued at £20 000, were exported. The exports in 1912 were as follows:

	lbs.
Essence of geranium	95 105
" " vetiver.	3 132
" " ylang-ylang	4 718
" " patchouli	110
" " citronella	489
" " longose	40

representing a total value of £90 730. Geranium is extensively cultivated. Ylang-ylang has taken a more important place with the rise in price of essences, which reached nearly £10 per lb.; important plantations established in the littoral zone and continue to exist to-day in spite of the fall in price. Other plant essences, such as patchouli, citronella, lemongrass, gardenia and "longose", are distilled with success.

Manioc. — This crop has increased greatly since 1892, when there were only three mills dealing with about 12 million lbs. of manioc. At present time there are seven mills producing about 4 ½ million lbs. of manioc and tapioca from about 40 million lbs. of tubers. During recent years manioc has been exported in small cakes containing 85 to 90 per cent. of flour. This product is used in France in the preparation of alcohol and liqueurs.

Textile plants. — The crop from these is not very profitable. *Crocydia gigantea*, or Mauritius hemp, yields only 35 to 40 per cent. of fibre. Sisal hemp (*Agave Sisalana*) yields a greater percentage of fibre for a higher price. An experiment in jute cultivation at the Botanic Garden was successful and the cultivation of this crop should be very important in the island, since more than half a million sacks are used annually in the sugar and manioc industries.

New crops. — Several new crops have been introduced during the last 20 years, the most important being the following: varieties of manioc in starch; sugarcane from Mauritius, Hawaii, Barbados, Australia; disease-resistant coffees, including *C. robusta*, *C. stenophylla*, *C. canephora*, and the varieties Maragogipe and Golden Drop, as well as some Javanese hybrids; new varieties of exotic tobacco, of which the White Burley, Connecticut and Szamoshati have given excellent results as cigar leaf; new selected varieties of aromatic plants, such as pogon, citronella, lemon-grass, patchouli, longose, gardenia, ylang-ylang, peppermint. New varieties of sisal hemp have been planted on a large scale. Since 1911 *Canna edulis* has been cultivated on the high plain; it yields a flour highly prized by biscuit makers. Of new forest trees the following have been introduced: the carob, Java kapok, various resin-yielding acacias, *Styrax benzoin*, etc.

New industries. — Preparation of perfumes by volatile distillation in new factories for the distillation of flowers with modern fractional distillation apparatus; a ground-nut-oil factory. The apparatus in the distillation factories has been greatly improved. A hydro-electric motor has been installed for supplying electric power to the port from the Galets.

The *Agricultural Service* was founded in 1854 with the institution of a Botanic Garden for the multiplication and preservation of useful plants in the colony. In 1907 a School of Agriculture was founded at Port Louis and in 1911 an experiment station followed. A scheme of reform of the experiment station and reorganization of the Agricultural Service has been presented to the General Assembly.

977 — The Royal Colonial Garden at Palermo. — Communication from the Professor A. BORZI.

The Colonial Section of the Botanic Garden of Palermo, which has existed since 1907, has now acquired autonomous administration and the functions of State Colonial Garden. In its new form, this institution is for study and experiment with exotic plants useful in industry and commerce with a view to the agricultural and economic development of the colonies and to the increase of agricultural production at home by means of new crops.

CROPS AND CULTIVATION.

The Effect of Climatic Conditions on the Rate of Growth of Date Palms. — JENSON, A. E., in *The Botanical Gazette*, Vol. LVII, No. 4, pp. 324-3:7 + 2 diag., Chicago, April 1914.

The observations on which this study of the effect of climate on the rate of growth of date palms is based were made at the Cooperative Date Orchard, Tempe, Arizona. The length of every leaf on four palms — two Deglet Noors and two Rhars — was carefully measured every week during 1906 and 1907. By the system adopted the maximum error did not exceed one-quarter inch. Daily records were also kept of maximum and minimum atmospheric temperatures, and of soil temperatures at 1, 3 and 6 inches below the surface. It was observed that after a new leaf has emerged well from the central bud, it makes the greater part of its growth in five or six weeks. In order to obtain a series of comparable figures representing weekly growth it was found that the sum of the elongation of the inner five leaves gave the most satisfactory series.

Both years the rate of growth was maintained late into the autumn, considerably in excess of the amount of heat available.

The rate of growth is most active not at the period of highest maximum, but rather at that of the highest minimum temperatures, which means in the night. This period coincides with the summer period of highest relative humidity, that is, in Arizona, in July, August and sometimes September, and it is at this time that weakly palms recover their vitality. By the greater part of the total yearly growth falls in the second half of the year. The rate of growth throughout the entire year is, in most cases, in proportion to the heat-time units over 50° F. (10° C.). Humidity is undoubtedly an important factor, but probably less so to date palms than to other plants.

The rate of maturation of the fruit is probably influenced by the same factors as the rate of growth of the foliage. The effect of high minimum temperature in promoting the ripening of the Deglet Noor date has recently been observed at Gafsa, in Southern Tunis.

9 - The Influence of Sulphur on Soil Acidity. — LINT, H. CLAY (New Jersey Agricultural Experiment Station, New Brunswick) in *The Journal of Industrial and Engineering Chemistry*, Vol. 6, No. 9, pp. 747-748, Easton, Pa., September 1914.

Considering the favourable results obtained by the application of sulphur to the soil for the control of some parasitic fungi which are capable of persisting in the soil (for instance *Oospora scabiei*, which causes potato scab), the question of its effect on the acidity of the soil requires a certain importance.

The researches of DEMOLON (1), BRIOUX and GUERBET have not only proved that the sulphur in the soil is converted into sulphates by bac-

(1) See No. 478, B. May 1913.

(Ed.).

terial action, but they have furnished data on the influence of various substances such as calcium carbonate, saccharose, peptone, etc., when added to the soil in which the sulphur was introduced.

In the writer's recent work under field conditions, as much as 600 lbs. of sulphur was applied per acre; it was noticed that a large amount of the sulphur was still present at digging time apparently in an unchanged condition. In order to ascertain facts on the rate of oxidation of the sulphur in the soil a series of tumblers containing 100-gram portions of soil were arranged, one-half containing sulphur, the other half without it; 33 mgms. of sulphur, equivalent to 1000 lbs. per acre-foot (3 000 000 lbs.) were added. The soils were made up to 20 per cent. moisture content and covered with Petri dishes. The moisture content was kept practically constant throughout the experiment, which lasted 11 weeks. One tumbler containing soil mixed with sulphur and one without were removed each week and tested for acidity.

It appeared that the sulphur had almost all been oxidized within the first eight or nine weeks. There is very little change in the acidity after the seventh week.

The fact that sulphur causes this increase in acidity under field conditions is shown by the following table, in which are the analyses of soil from four old potato rows to which sulphur had been applied the preceding year; the fifth row had not received any sulphur.

In valuing the results it must be borne in mind that rows 1 and 2 had received ammonium sulphate, while rows 3 and 4 had had sodium nitrate.

Row	Rate of sulphur application, lbs. per acre	Lime requirement, in lbs. CaO per acre
1	600	3 187
2	300	2 590
3	600	3 025
4	300	2 247
5	none (check)	883

Laboratory experiments show that sulphur oxidizes more rapidly in sandy than in clay loams, and in those kept constantly at 20 per cent of moisture than in those allowed to dry from time to time.

980 - Acid Mineral Soils. — DAIKUHARA, S., in *The Bulletin of the Imperial Central Agricultural Experiment Station, Japan* (article in German), Vol. II, No. 1, pp. 1-40 - table. Nishigara, Tokio, March 1914 (1).

The acid reaction of certain soils is generally due to the presence of humic acids; other causes are the oxidation of pyrites particles, repeated application of certain fertilisers, such as sulphates of ammonia and potash on soils poor in lime, volcanic emanations or the initial fermentation of organic manures, such as green crops, cakes, straw, fresh dung. There is another instance of acidity in purely mineral soils which has not yet been

(1) See also preliminary note, abstract No. 600, B. July 1914.

ed. It is produced by the adsorption of compounds of iron and alumina by colloids of the soil, which then give an acid reaction to litmus. If of this type free from humic acids, the acidity persists after leaching, which is insoluble; but treatment with a solution of neutral salts, such as sodium chloride, potassium sulphate, potassium nitrate, sodium chloride, results in the appearance in solution of free acid with the compounds of iron and alumina. Since the salts of iron and alumina are adsorbed by the humic acids and other colloids of the soil and are set free again on treatment with neutral salt solutions, these compounds must exercise considerable influence not only on the acidity of purely mineral soils, but also on that of soils containing humus.

The injurious action on vegetation of compounds of alumina and iron adsorbed by the soil colloids is due chiefly to the liberation of soluble acid from iron and alumina on the application of saline manures.

In Japan and Korea a large number of soils, making about three-quarters of the samples examined, show an acid reaction, due in more than half the cases to compounds of alumina and iron. Soils of Mesozoic origin show most often an acid reaction; they are followed by the Tertiary, Quaternary and Pleistocene, whilst alluvial soils show acidity only half as much as the Mesozoic. Further, soils formed from so-called acid crystalline rocks show acidity in a larger number of cases than those from basic rocks, and those formed from volcanic ashes still less frequently show acidity.

Litmus paper is the simplest means of determining qualitatively the acidity of a soil. More exact methods are those of Baumann and Gully (1906). The writer proposes an equally exact and simpler method using potassium nitrite. It consists of treating 5 gms. of soil in a test-tube with a 10 per cent. solution of pure potassium nitrite, adding it drop by drop until the soil becomes thoroughly moist; the test-tube is then closed with a plug of cotton-wool, from which hangs a strip of starch-iodide paper. After a certain time the degree of acidity of the soil can be determined by the intensity of the blue coloration of the paper.

The property of liberating free acid from neutral salts possessed by the compounds of iron and alumina has suggested to the writer a method of determining quantitatively the acidity of soils by means of potassium chloride. For this 100 gms. of air-dried soil are treated with 250 cc. of a normal potassium chloride solution in a retort of 600 cc. capacity during 24 hours, shaking it at intervals, or better placing it in a shaking machine for 24 hours; 125 cc. of the supernatant liquid are then taken and boiled to free from carbon dioxide, when it is titrated with a decinormal solution of caustic soda, using phenolphthalein as indicator. A further 125 cc. of the potassium chloride solution is added and the titration repeated. This process is repeated until all the acidity has been determined. By determining the relation of the first titration to the total quantity of acid the method is reduced to one operation; the writer is preparing a formula for this purpose. Tables are also given showing the quantity of limestone or quicklime necessary to neutralize a given quantity of soil.

The above-mentioned acid soils are generally deficient in lime, the ratio of lime to magnesia being unfavourable to growth. These observations are summarized in the accompanying table.

Reaction of the soil and the ratio $\frac{\text{lime}}{\text{magnesia}}$

Reaction of Soil	Mineral acidity of Soil — cc. of $\frac{N}{10}$ NaOH	Cultivated Soils		Uncultivated Soils	
		No. of samples	Mean ratio lime magnesia	No. of Samples	Mean ratio
Extremely acid	> 20	8	0.81	15	0.7
Very acid	20—5			20	0.7
Acid	5—1	13	0.88	11	0.9
Fertile acid	< 1	12	1.33	20	1.1

981 — Irrigation in Spain. — DE LA ROSA, FERNANDEZ, in *Boletín de Agricultura y economía, Dirección general de Agricultura, Minas y Montes*, Year VI, No 67, pp. 622. Madrid, July 31, 1914.

Except for the north-west of the Iberian peninsula where the rain is abundant and regular, almost the whole of Spain suffers from frequent drought or irregular rainfall. The problem of irrigation therefore presents itself and has been dealt with since the remotest times. Proof of this is found in the remains of hydraulic works of aboriginal tribes and of the Roman period, also in the irrigation canals constructed by the Arabs watering the orchards of Valencia and Murcia and the rich plains which extend from the mountain slopes in the districts of Malaga and Grenada and the regions bordering the Ebro. Later constructions are the great canals of Urgel in Catalonia and Imperiale in Aragon, but it was not until the end of last century that they were utilized to the full.

Three systems of irrigation are practised in Spain: 1) by means of pumps from which the water is raised by wheels or more rarely mechanical pumps; 2) canals fed by the large rivers by means of hydraulic wheels or dams; 3) artificial lakes ("pantanos") which feed the irrigation canals. Preference has been given to the collection of water in reservoirs, in place of the deviation of rivers, owing to the fact that during the winter rains become devastating torrents, whilst during the summer the water is considerably reduced and many rivers dry up. The total irrigated area is estimated at 3 233 108 acres, of which about 200 000 acres are irrigated by subsoil water. This area is distributed in the four great districts of Spain as follows:

1. Aragon and Navarre: The canals Imperiale, Tauste, Jalon, Gállego, Huerva, and artificial lakes of San Bartolomé, and of Mezalocha in the province of Saragossa; canal of Jaca, reservoirs of Huesca and Hijar.

ion canals from the Guadalaviar, the Jiloca and the Martín in the provinces of Teruel and Huesca; artificial lakes of Grágera, Calahorra, and Vera in the province of Logroño, and canals of the Río Llano and Bayuna in the province of Pamplona. The total irrigated area is 580 091 acres.

Catalonia: The canal of Urgel in the province of Lerida; canals of Manresa, the Infanta and others fed by the Llobregat in the province of Barcelona; numerous branches from the Ebro in the province of Tarragona; small reservoirs of Puigcerdá, Figueras, La Bisbal and Santa Coloma Farnés in the province of Gerona; in all about 472 920 acres irrigated.

Levante: Irrigation canal Real del Júcar de la Mayor and numerous others from the Turia and Palancia in the province of Valencia; canals of Mijares, which fertilise the "Plana" in the province of Castellón; artificial lakes of Tíbi, Elche and Elda in the province of Alicante; irrigation canals by filtration from the Segura, Guadalentín and Moratella, and artificial lakes of Puentes and the Val de Infierno in the province of Murcia: total 629 259 acres.

Boetic-Mediterranean region: The rivers Genil, Guadix, Dauro, Illora and Gadalfeo in the province of Granada; canals of Guadaro and Genal, artificial lakes of San Pedro Alcántara and San Luis de Sabinillas, and the Alis of Marbella in the province of Málaga; numerous streams or small canals ("caceras") from different watercourses in the province of Almería; in all 364 690 acres under irrigation.

The above sixteen provinces comprise about two-thirds of the irrigated area in Spain; the other thirty-three provinces make up the remaining third.

Since 1900, the Government has initiated hydraulic works on a large scale and organised a special Department consisting of 10 divisions, for carrying out the numerous projects. The following works have been completed: artificial lakes at Mesalva (Teruel), Grágera (Logroño), Peña (Huesca), Casset (Ciudad Real), Talava and Alphonso XIII (Albacete) and the Aragón and Catalonia canal.

The following are in course of construction: the artificial lakes of Cueva de la Madada and Pena (Teruel), Tolx (Barcelona), Riudecañes (Tarragona), Guadalupe (Córdoba) and Guadalcacín (Cádiz). Amongst the numerous projects in course of discussion, the most important concern the artificial lake of the Ebro, the artificial lake of Cuerda del Pozo in Duero, and the irrigation of the lower valley of the Guadalquivir, in the provinces of Córdoba and Seville. On the completion of these works during the next ten years, unless unexpected developments arise, over a million acres of land will be brought under irrigation. Nevertheless, the total area suitable for irrigation is at least 10 million acres, and it will require many generations before the irrigation requirements in this country are completed.

Artesian wells have been tried in some provinces for several years, but with only meagre results. Though satisfactory in certain parts of Levante, they were a complete failure in other parts of the southern region. The boring of these wells in the province of León was successful, especially at the Royal estate of El Pardo.

982 - **Experiments with Bacterized Peat.** — *The Agricultural News*, Vol. XLIX, No. 321, p. 263. Barbados, August 15, 1914.

Experiments have been made with a view to determining under English conditions the practical value of Professor BOTTOMLEY'S (1) bacterized peat.

One series was conducted in the open ground and the other on plants in pots and boxes. During the former a drought occurred which rendered it difficult to draw any conclusion as to the beneficial effect produced by bacterized peat.

But when artificial watering was adopted in order to compensate for the lack of rain, the favourable results were always evident. In one experiment with lettuces and radishes grown in ordinary garden soil and manure with different substances which included guano and bacterized peat, the results showed these two substances to be of about equal value.

But the most interesting series of trials and the one which seemed to show conclusively that bacterized peat is of value, was that in which radishes (96 per box) were grown in ordinary soil in boxes 1 yard square and treated as indicated in the following table:

	Roots	Tops	Total Weight
	lb. oz.	lb. oz.	lb. oz.
Control, two boxes, average	0 11	0 8 $\frac{1}{2}$	1 19
Farmyard manure, small dressing	0 12	0 12	1 8
Guano ($\frac{1}{2}$ oz. before sowing, and $\frac{1}{2}$ oz. top dressing)	0 14	0 8 $\frac{1}{2}$	1 6 $\frac{1}{2}$
A well proved fertilizer, $\frac{1}{2}$ oz. before sowing and $\frac{1}{2}$ oz. top dressing	1 0	0 11	1 11
Nitrolin (3 oz. per box before sowing)	1 3	0 12	1 15
Bacterized peat (4 oz.)	1 8 $\frac{1}{2}$	0 13 $\frac{1}{2}$	2 6
Bacterized peat (8 oz.)	1 5	0 11	2 0

The result shows: 1) that bacterized peat is of high manurial value; 2) that it favours the development of both roots and tops (leaves) but especially the former; 3) that, as has been observed in other experiments, lighter dressing of bacterized peat is somewhat more effective than a heavier one. Incidentally the experiment goes to show that nitrolin is a fertilizer which deserves a good trial on garden crops.

Bacterized peat used in the relatively small quantities in which it can be used effectively does not appear to exercise a beneficent action on the water-holding capacity of the soil; it has valuable manurial properties and these do not seem to be limited to the provision of nitrogen.

These experiments confirm the results reached by the earlier experiments at Kew and elsewhere.

(1) See No. 410, B. May 1914.

The New Potash Deposits of Salinas de Girona. — *Boletín de Minería*, Madrid, August 31, 1914, Vol. 98, No. 16, pp. 338-339.

1. — Following the discovery of potash salts in Spain, the regulation of the

According to this, the deposits in the neighbourhood of Cardona (prov. of Barcelona) give hope of considerable

it, as much by the area, depth and length of the beds as by the quantity of the minerals. Various companies have explored these deposits and have obtained for concessions several thousands of acres in area, not only in the province of Barcelona but also in those of Gerona, Lérida and Huesca.

The Spanish Government, realizing the importance of the question, has nominated a commission of the Geological Institute of Spain to undertake the necessary researches. This commission has issued a memoir confirming the favourable prospects of the discovery. Considering that the production of potash salts in Spain has reached the value of £149,270 (731,750 pesetas) and that it will increase considerably when the price is raised, the Spanish Government considered it advisable to submit to Parliament measures concerning the exploitation of these discoveries, for the benefit of agriculture and national prosperity.

The first article of the law reads as follows:

"From the date of publication of this law all mining concessions for potash salts and other minerals employed as manures or for the fabrication of manures, including all minerals containing or capable of producing such substances, even though the concessions may have been granted under another denomination, are placed under state control with regard to production and sale of the products obtained. The concessionaries must undertake to continue the prospecting and working of the concessions without interruption.

"The State reserves the right to regulate and change the manner of working in the interests of the public and to impose special conditions on the interests of the national consumption, such as the imposition of a tariff on exported products."

2. — In confirmation of the above it is useful to note that amongst the most important of the concessionaries is an American firm, the "American Agricultural Chemical Co.," which has undertaken the working of some of these deposits. The last report of this company gave promise for the future and stated that the deposits resembled those in Germany.

3. — In this connection may be considered the communication of Professor Schmidt before the last meeting of the German Geological Society at Berlin and the discussion which followed.

The deposits of potash salts are found in the Tertiary strata of the Cardona basin, i. e. in the same region as the large mass of rock salt at Cardona

Documentos parlamentarios, Círculos de abonos ó que sirven para su fabricación, Year VI, No 66, pp. 730-743. Supply. — *The Engineering and Mining Journal*, September 12, 1914. — 3, 5, 11, 14. *Die Kunst- und Industrie*

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ject to the chemical work of the plant. In order to reduce the respiration functions to a minimum, the plants were placed for 11 days in a jar facing north with diffused light of low intensity. In this case also, analysis showed that the nutritive solution contained more sugar at the end of the experiment than at the beginning and that the plant had consumed some of its reserve sugar. The exchange between the root and the nutritive solution is not therefore in accordance with the laws of osmosis.

In a medium containing excess of one or several ingredients, the plants become impervious even to water. Considering that in the case of nutritive solutions colloidal organic bodies are absorbed, it is probable that the function of absorption of the roots is one of filtration, the rate of which is determined by the chemical activity of the plant at any given moment.

987 - **The Influence of the Osmotic Pressure of the Soil Solution on the Growth of Spring Wheat.** — TOULAIKOFF, N. (Director of the Experiment Station of Saint-Petersbourg, Russia), in *La Pédologie*, Year XV, No. 4, pp. 71-103. Petrograd, 1910.

Analyses of the nitrogen content of wheat grains in south-east Russia show a slight increase in the nitrogen content of wheat from saline soils. This fact had already been noticed by V. S. BOGDANOV in his work on the wheats of the district of Novouzensk.

The higher protein content of wheat from south-east Russia is formerly attributed to the low rainfall. This explanation is plausible if the low rainfall accounts for the increased concentration of the soil solution. The writer was therefore led to study the physical, as distinct from the physiological, effects of salts on the wheat plant, as in the early stage of development the germinating grain is subject more to the physical than to the chemical changes of its environment. As the swelling and germination of the grain depend chiefly upon the rapidity of absorption from the surrounding solution, it seemed advisable to begin by studying the influence of the osmotic pressure of salts on growth.

Experiments were made with the salts occurring in the region of Saint-Petersbourg, viz. NaCl , Na_2SO_4 , etc. They were carried out in 1910-13 in zinc vases containing about 11 lbs. of black soil (chernozem) fertilized with the spring wheat Biélotourka. The necessary nutritive solution was supplied in order to obtain the maximum yield of vegetable matter. In the calculation of the osmotic pressure in the soil solution, the humus matter already present in the soil and that added is omitted, as it is not possible to determine it by ordinary methods. However, the same quantity of soil and manure was added to each pot, the osmotic pressure of the soil solution may be considered the same in each case (about 4 atmospheres) and left out of account. Therefore in speaking of 3, 10 atmospheres of osmotic pressure, the figures refer to the increase in osmotic pressure due to the non-nutritive salts added. The control plants containing no non-nutritive salts were maintained at a constant osmotic pressure of about 4 atmospheres by maintaining a constant humidity of 60 per cent. of the maximum by means of daily spraying with distilled water. Both nutritive and non-nutritive salts were added to the

me of filling. The osmotic pressure of the solutions of non-nutrients was determined for the pure salts, and not their mixtures.

experiments in 1910 and 1911. — These were only of a preliminary character to determine the suitable limits of osmotic pressure.

experiments in 1912. — The following salts were used: sodium chloride, sulphate, magnesium sulphate, sodium carbonate and ammonium

The first three were also used in mixtures of two and three. Ammonium nitrate was not used as a nutritive salt, but only to increase osmotic pressure. The osmotic pressures compared were 0, 5, 7, 12 atmospheres.

Five sprouted grains of wheat were planted in each pot on the 13th

On the 18th, the control pots and those with a pressure of 5 atmospheres showed seedlings 5 cm. high. The seedlings in pots of higher pressures were much shorter, but not so much in the case of ammonium nitrate plants in the control pot commenced tillering on the 24th of April, the others did not begin before the 28th and 29th. They were thin on the 2nd of May, leaving only seven plants in each pot. The height of the plants was measured on the 15th and 29th of May and the 7th of June.

It was found that during the first period of vegetation small quantities of salts stimulate the vegetative growth of wheat, but that they retard it: towards the 3rd of June the control plants were higher than all the others.

An increase of osmotic pressure causes an appreciable diminution in the growth of the variety Biélotourka, though it hastens the appearance of the flowering and the ripening, thus shortening the vegetative period.

Exception to this occurred in the ammonium nitrate pots, in which the phases were retarded and the vegetative period was longer even than in the controls.

When the plants reached maturity they were submitted to the following measurements: length of ear, yield of total vegetable matter and of grain, weight of roots, percentage of nitrogen in grain, coefficient of transpiration (calculated). The data obtained showed that increase of osmotic pressure decreases the yield of total vegetable matter and grain, the length of ear and the weight of 1000 grains, whilst it increases the percentage of nitrogen in the grain even in soils rich in nitrogenous matter.

experiments in 1913. — The maximum osmotic pressure was reduced from 15 to 12 atmospheres and for every salt experimented with two additional pots with an osmotic pressure of 3 atmospheres were added. Since the experiments of 1912 had shown that the salts of the soil solution can be considered as merely increasing the osmotic pressure, but as exercising other influences, physical, physiological, etc., it was considered advisable to increase the number of salts under experiment. The following were therefore used: sodium chloride, ammonium chloride, calcium chloride, magnesium chloride, sodium sulphate, ammonium sulphate, ammonium sulphate, sodium nitrate, ammonium nitrate.

The results obtained are summarised in the Table below, which shows the existence of a stimulating action of all salts when the osmotic

pressure reaches 3 atmospheres. At this pressure, under 1913 conditions the coefficient of transpiration of Biélotourka was lowered, while the yield and the yield of grain were increased, although the weight of 1000 grains was decreased by 1.1 gm. from that of the controls.

Mean results of 1913 experiments.

Osmotic pressure of soil solution	Water evaporated, gms.	Coeff. of transpiration	Total yields, gms.	Yield of grain, gms.	Weight of 1000 grains, gms.
Normal	15 622 (maximum)	314.2 (minimum)	48.2 (maximum)	18.71 (maximum)	38.27
» + 3 atmospheres	16 156	291.5	55.44	22.43	37.14
» + 5 »	11 503	307.2	38.37	15.16	33.70
» + 7 »	9 207	362.5	29.72	10.15	24.01
» + 10 »	5 998	418.9	17.48	4.46	23.13
» + 12 »	3 494	630.7	7.30	2.72	22.47

An increase of osmotic pressure above 3 atmospheres caused a decrease in the yield of grain and in the 1000-grain weight, as well as a less utilisation of the soil moisture, assuming that the coefficient of evaporation increases proportionally to the increase in osmotic pressure. On the other hand an increase of osmotic pressure caused an increase in the percentage of nitrogen in the grain and in the flintiness, but a decrease in the percentage of starch.

Action of different salts and their elements.

A. *Acids.* — 1) At an osmotic pressure of 3 atmospheres the maximum of total yield and yield of grain are obtained from nitrates, which is followed by sulphates and then by chlorides.

2) At 5 atmospheres the highest yields are given by the sulphates, followed by chlorides with respect to grain and nitrates for still less yields.

3) At 7 atmospheres, the yield is better with sulphates than with nitrates.

B. *Bases.* — At 3 and 5 atmospheres ammonium salts give the highest increase of total yield and of grain yield, as well as the largest percentage of nitrogen in the grain. In respect to yield the salts of magnesium second and those of sodium third. In respect to percentage of nitrogen sodium salts come second and magnesium salts third.

Conclusions. — 1) The character of the soil solution, especially its concentration and osmotic pressure, have a distinct influence on the functions of spring wheat. Increase of osmotic pressure at first stimulates growth, then beyond an optimum limit of 3 atmospheres, whatever the salt, it has a depressing influence on growth, but at the same time increases the percentage of nitrogenous matter in the grain.

2) Under certain meteorological conditions, a very pronounced stimulating action on the wheat plant can be obtained by bringing the osmotic

up to the optimum, irrespective of the salt used. This results in a higher yield of straw and grain, a better quality of grain, a higher nitrogen content and a more efficient utilisation of the soil moisture by the plant.

3) The presence of nitrogen in solution, either as base or acid, appreciably increases the yield of straw and grain as well as the percentage of nitrogen in the grain, compared with non-nitrogenous salts. Of the latter, phosphates have a greater influence on yield than chlorides.

- The Action of Various Electrolytes on the Grains of *Avena sativa*. — PLATE, F., in *Annali di Botanica*, Vol. XII, Part 3, pp. 261-343. Rome, May 1914.

These researches concern the stimulating effect of chemical agents on the imbibition of grains of *Avena sativa*.

It is well known that seeds are able to resist injury from solutions of salts up to a certain concentration and that such solutions exert influence on the subsequent development of the embryo and seedling. In these experiments the effect of the different ions of acids, bases and salts was investigated. The strengths of the solutions used were

$\frac{N}{2}$, $\frac{N}{5}$, $\frac{N}{10}$, and the period allowed for absorption was 2 hours. The

increase in weight of the seed was determined at intervals of half an hour. Observations were made of substances which accelerate or retard germination and on the effect of imbibition on the external morphological characters of the seedlings with special reference to the size of the shoot and root, and the fresh and dry weight of the seedling. The quantities of salt absorbed were determined by weighing and also in parallel series of experiments by analysis of the liquid remaining after each period.

From these results the writer concludes that immersion for only two hours exerts an influence in many cases not only on the physico-chemical phenomena of imbibition, but also on the subsequent development of the seedlings. The absorption of distilled water or tapwater varies within certain limits according to the individuality of each grain, but generally it increases rapidly during the first stage of immersion, continues more steadily during the second stage and decreases slowly during the third stage until it ceases completely. The beginning of imbibition and the quantity of water absorbed vary with different grains, with different solutions and according to the concentration. These experiments confirm the conclusion that during imbibition, seeds absorb more proportionally of the solvent than of the electrolyte, so that the solution becomes more concentrated after immersion.

Classified according to their effect on imbibition the substances are grouped as follows :

1) Substances not absorbed and having no influence on imbibition : the chlorides of sodium, potassium, calcium, barium and zinc ; bromides of sodium and potassium ; nitrates of potassium, barium, cadmium and silver ; sulphates of potassium, cadmium and copper ; formate, acetate, and oxalate of potassium.

2) Substances absorbed without influencing the total amount of liquid absorbed under normal conditions : the chlorides of cobalt and iron.

3) Substances which, though not absorbed, diminish considerably the imbibition: acid phosphates of sodium and potassium, sulphate of aluminium, chromium and iron.

4) Substances which, though not absorbed by the seeds, not only diminish the imbibition but also influence the germination: ferrocyanic permanganate and bichromate of potassium; the alums of potassium, chromium and iron; the nitrites of sodium and cobalt; the chlorides of cerium, tin, cadmium and mercury; bromide of mercury.

5) Substances which are absorbed and diminish the imbibition as well as affecting germination: iodides of cadmium, sodium, potassium and the nitrates of mercury and cobalt.

6) Substances absorbed, increasing the imbibition and also favouring the germination: formic, acetic, oxalic, nitric, sulphuric and phosphoric acids.

7) Substances not absorbed, but accelerating imbibition and to a considerable extent promoting germination: malic, citric, tartaric and hydrochloric acids.

Excluded from this list are the hydrates of the alkalis and alkali earths, which in the concentrations used were fatal to the grains.

It follows from these results that substances which are absorbed a period of two hours, do not penetrate throughout the seed, but are rested at the testa. It remains to be determined if they will penetrate further if imbibition is prolonged.

Malic, citric and tartaric acids are most favourable to growth, though they are not absorbed by seeds. This is explained by supposing that an indeterminate trace of acid acts on the seeds catalytically and causes greater acceleration of the physico-chemical processes.

These researches support the conclusion that the laws of absorption are not constant for all solutions and concentrations, but that special coefficients of absorption should be attributed to each cation or anion.

The specific actions of hydrogen ions and hydroxyl ions have considerable biological importance, and it is probable that the carboxyl group is not less important.

989 - Effect of High Frequency Currents on Plants. — HOMBERGER, ERNST. *Die Umschau*, Year XVIII, No. 36, pp. 733-735 + 2 figs. Frankfurt-on-the-Main, September 5, 1914.

The writer recalls the observations of Lemström, who attributed the greater rapidity of growth in polar regions to the higher potential atmospheric electricity, and the experiments in electroculture carried out by Lemström, Lodge and others. While the use of high tension continuous or alternating currents led directly to the soil and to the plants was always connected with injury to the latter as soon as the intensity of the current exceeded certain limits, this injury was no longer observed when alternating high frequency and high tension currents were employed.

Experiments of this kind were recently conducted in the Moräne near Dayton in the United States. Several experimental plots were sown with radishes and salad. After they had sprouted the electric current was started.

the plot was subjected to the action of high frequency currents which passed through a wire stretched at about 16 inches above the soil. The difference of potential between the soil and the conductors was about 10 000 volts; the frequency was of 200 000 periods per second generated by Tesla currents. The passage of the current lasted one hour in the morning and one hour in the afternoon. The growth of the salad compared that of the check plot was increased by about 75 per cent.

Alternating high frequency currents are biologically harmless to plants, animals and man. Arsonval introduced them into therapeutics. On transforming high tension into high frequency, diathermic currents are obtained with which heat can be produced in the deep strata of animal tissues. With the diathermic apparatus the human body can be traversed without danger by currents of an intensity somewhat over 1 ampère; if the intensity be too much increased does combustion take place.

The writer experimented upon plants with such an apparatus; he used the two electrodes in flower-pots with plants between them. Most of the experiments were carried out with beans, and they regularly showed that the stem grew thicker and the leaves larger than in the check plants. During the experiments three treatments per day were made; as soon as the temperature reached 35° C. the current was interrupted. The length of time that the soil retained the heat was remarkable and still more so that the stem and the leaves formed a greater quantity of chlorophyll than those of the check plants.

In order to determine whether the greater intensity of growth was due to the heat or to the high tension of the electromagnetic field, the writer treated other plants of beans with Tesla's currents (that is high tension and high frequency). The effect of one such treatment lasting 5 minutes was very evident and proved that the stimulus to growth is due to the oscillating field and not to heat. The greater formation of chlorophyll in the treated plants is perhaps due to the fact that under the influence of the oscillating electro-magnetic field chemical decompositions take place in which organic molecules take part; these decompositions are similar to those caused by the catalytic action of the still more rapid luminous vibrations.

Influence of X-Rays on Vegetation. — MÈGE, EM., and COUPÉ, H., in *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 159, No. 4, pp. 338-340. Paris, July 27, 1914.

Experiments were made on *Raphanus sativus* and *Lepidium sativum*. 20 seeds were sown in each of a number of pots of garden soil and covered with half an inch of leaf-mould. The pots were then subjected to the action of the rays; the frequency and the intensity of the radiations varied in the nine groups that were made. Differences began to appear on the 22nd day; the experiment terminated on the 38th day.

From the results of these preliminary experiments the writers conclude:

1. That X-rays exert a clearly favourable action on the vegetation of both *Raphanus* and *Lepidium*, as shown by the increase of weight, which attains in *Raphanus* 45 per cent. for the leaves, 59 per cent. for the whole plant and 193 per cent. for the bulb.

2. — That this benefit is all the more marked the more frequent and intense the radiations, also when they attain an intensity (75 H. per month) which would render them decidedly injurious to animal tissues.

3. That X-rays have a slight reaction on the morphology and anatomical structure of the plants under consideration (in general the vascular and supporting tissues are more developed and better differentiated).

991 — A Study on the Germinating Power of Seeds. — DARSIE, MARVIN L., ELIZABETH CHARLOTTE, and PEIRCE, GEORGE J., in *The Botanical Gazette*, Vol. LVIII, No. 3, pp. 101-136 + 18 figs. and diagrams. Chicago, August 1914.

Until recently the tests of the longevity or viability of seeds have depended upon the percentages of actual germination in prepared beds. Such tests are simple enough in the case of seeds which germinate quickly and in these cannot be improved upon. When, however, two weeks or more must elapse even under most favourable conditions before one may know the quality, that is the germinating power, of the seeds, a quicker method desirable, also because in briefer exposure there is less danger of injury, loss from fungus or other enemies. Mr. G. J. Peirce has shown that by using silvered Dewar flasks as calorimeters one may quickly determine that heat is evolved in the germination of seeds and has suggested that there may be such differences in the heats liberated by seeds of different ages that they may be used as indicators of age and germinating power or viability.

Some experiments were undertaken in order to test this idea.

The germination experiments were made in silvered Dewar flasks and in seed beds with seeds of barley, clover, maize (Cory sweet corn), hemp, oats and wheat of different and well known ages. The results show that, other conditions being equal, a high temperature within a reasonable time is indicative of high germinating power, and also of the ability to make a rapid growth of root and shoot after germination, in other words of vigour. With the increase of the age of the seeds the quantity of heat produced diminishes, but of course such decrease is not always perfectly regular, owing to the different climatic conditions under which the seed was grown and harvested, to its degree of maturity and to the conditions of storage. Each species of plant that was studied appears to have, like the higher animals, a "normal" or characteristic temperature, departures from which indicate deviations from the best conditions of the organic life. Other conditions being equal the "normal" temperature is evolved by the freshest and most vigorous seed: a higher temperature generally indicates an infection (fungoid); a subnormal temperature on the other hand denotes lessened vigour, generally due to increased age.

The "normal" temperature, or average daily heat yield in terms of 10 grams of seed, is 1.82° C. for hemp, 0.75° C. for clover, 0.73° C. for wheat, 0.55° C. for oats and 0.49° C. for maize.

992 — Selection of Cocksfoot (*Dactylis glomerata*) in New Zealand. — F. W. S., in *The Journal of Agriculture*, Vol. VIII, No. 3 pp. 262-265 + 2 figs. Wellington, 1914.

Cocksfoot is one of the most widely distributed and most useful grasses of New Zealand. Its seeds, especially those from the Banks Peninsula

lucrative export trade to Europe. This plant, however, being so distributed and growing in the most different environments, pre-number of types and variations. It has been found that the varicocksfoot apply not only to the form of the panicle, but also to the quality, shape and colour of the leafage, to the height, to the degree resistance, to the earliness of maturity, to the yield of seed, etc. sequently at the Moumahaki Experiment Farm a work of selection started with the aim of producing plants with abundant and good and with a high resistance to rust. Plants exhibiting these desired a greater or less extent have been isolated, and the reproduction ed types is being effected by vegetative or clonal reproduction, by seed and by open fertilized seed.

utation in Egyptian Cotton. — KEARNEY, THOMAS H. (Physiologist in Charge, i and Drought Resistant Plant Investigations, Bureau of Plant Industries) in al of *Agricultural Research*, Vol. II, No. 4, pp. 287-302 + IX plates. Washington, 1914.

2 writer summarises as follows the facts that he has ascertained e literature on the subject and from the observations made by him his work of selecting cotton in Arizona.

e origin of the Egyptian type of cotton is obscure. According to sory, it is a product of hybridization between a brown-linted tree and American Sea Island, both of these types having been culti- a Egypt nearly a century ago. Whether this be true or not, there no question that the varieties now grown are of mixed ancestry, a on which some investigators regard as favourable to mutation. umerous varieties have appeared from time to time in Egypt. The ri variety, now grown only in Upper Egypt, originated about 1850. riety gave rise in 1887 to the Mit Affi, and from the latter the Abassi, itch, Nubari, Sakellaridis and Assil varieties have successively been pd.

grown in Arizona from imported seed, most of the Egyptian vari- re readily distinguishable by the habit of the plants and by the bers of the leaves, involucre and bolls, as well as by the fibre.

far as the scanty evidence goes, each of these varieties originated mutant, i. e. an individual plant which showed an abrupt and defi- ange in the characters expressed. This conclusion is supported more complete data at hand regarding the history of the varieties have been developed in Arizona.

ant breeding work in Arizona was begun 12 years ago with imported the Mit Affi variety. Persistent selection of the best plants caused mprovement in earliness and productiveness and in the quality of re, but the progress was not very substantial prior to 1908, in which o types very different from the Mit Affi were recognized and isolated. : these was the Yuma variety, now commercially grown in Arizona. um has continued to express its distinctive characters with a high of uniformity, notwithstanding the fact that the parent individual s immediate progeny were not protected against cross pollination.

Two additional varieties described in this paper under the "Pima" and "Gila" have lately been developed in Arizona. The Pima variety appeared as a single plant of marked individuality in a field of Yuma cotton at Sacaton, Arizona, in 1910. Its characters have been expressed in its progeny with great uniformity during the three subsequent generations. This variety is easily distinguished from the parent Yuma variety by its relative limblessness and by the correlated retention of the lowest flowering branches and bolls; by the more uniformly deeply 5-lobed leaves, the shorter, relatively wider, and nearly separate involucre bracts; by the plumper and more abruptly and sharply pointed bolls and by the longer fibre (average length of fibre: Yuma 1 1/2 inch; Pima 1 5/8 to 1 7/8 in. Gila 1 7/16 in.).

The Gila variety is derived from a single plant discovered by Mr. J. Hudson in a field of the Mit Affi stock grown at Sacaton, Arizona, in 1911. In its external characters this type resembles the parent Mit Affi variety much more than the Yuma, but differs in its earlier ripening, in its more vegetative branches, greater productiveness and longer fibre.

The individuality of the parent plant, together with the uniformity shown by its progeny during the subsequent generations, indicates that the Gila variety, like the Yuma and the Pima, is of mutational origin.

Egyptian cotton exhibits, although in a minor degree, the tendency to develop new varieties by mutation which characterizes *Oenothera lamarckiana*. There is a further parallel in the fact that in both cases very similar, if not identical, new characters come into expression at different times and in different places. An example of this phenomenon in Egyptian cotton is afforded by the Nubari and the Yuma varieties.

If the tendency to produce mutants is a result of remote or close hybridization, the mutability of Egyptian cotton might be accounted upon either of the following grounds: 1) the supposed hybrid origin of the type as a whole, or 2) later crossing with other types of cotton.

Ever since mutation became recognized as a factor in the breeding of Egyptian cotton the following methods have been followed in its selection: 1) recognition and isolation of desirable mutants; 2) selection and comparison on the progeny-row basis of those individuals among their parents which express most fully the desirable characters of the new type; 3) selection from the seed increase fields, preferably before blossoming, of the aberrant and otherwise undesirable individuals.

The bibliography of the literature cited comprises 21 works.

994 - **New Varieties of Wheat and Oats in New South Wales.** — PRIDEHAM, J. *The Agricultural Gazette of New South Wales*, Vol. XXV, Part 3, pp. 230-231, 3 figs., p. 236 + 2 plates. Sydney, March 1914.

Varieties of wheat. — The new varieties of wheat obtained or improved by the Department of Agriculture are grown in the stud plots and compared with the standard varieties to determine their yielding qualities and defects and good points. A sample of any variety found promising in the field is sent to the Departmental Chemist to be milled, and is recommended for sowing.

farmers if it yields a satisfactory flour; if it fails in this respect it is not included among the list of varieties recommended.

In 1913 two varieties, "Bomen" and "Sunset", were recommended for further trial and they have fully justified that recommendation. Other varieties, "Canberra" and "Nardoo", are suggested for further trials at the Experiment Farms. The writer describes these four varieties. "Bomen" is awnless and bunt-resistant; in its pedigree it includes an Indian variety "Zaff", one from Manitoba, "Power's Fife" and two Australian wheats. "Sunset" is also awnless; it is intermediate between the medium strong and weak flour classes, and is very early. "Canberra" is slightly awned at the tip; it is a cross between Federation (the dam), and Volga riley, a two-rowed sort; it has yielded well and gives a high percentage of flour which is of excellent colour and belongs to the medium strong class. "Nardoo" is awnless, medium horny; it is decidedly smut-resistant and an excellent hay wheat; it is a hybrid of several varieties, including "White Naples".

Varieties of oats. — Among the oats recommended for further trials at the Experiment Farms by the recent Departmental Conference are "Sunset" and "Guyra". "Sunrise" is a natural cross bred from Algerian oats, which it surpasses in length of straw by about a foot, and in earliness by a week; it is recommended for the warmer districts. "Guyra" is a cross between "Algerian" and "White Ligovo"; it stools very fairly and its grain is plump; it is suited to typical oat districts.

95 - The Effect of Ammonium Salts on the Tillering of Wheat. — WILD, L. J., in *The Journal of Agriculture*, Vol. IX, No. 1, pp. 31-32, Wellington, N. Z., July 1914.

This experiment was suggested by a statement in Dr. Griffith's "Treatise on Manures", to the effect that treating the seed wheat with a solution of sulphate of ammonia gives an increase in the number of stems produced by the individual plant. Five varieties of wheat were treated with nitrate of ammonia and three with sulphate of ammonia in 3 per cent. solution, and sown in plots of from 10 to 15 square yards in area. Check plots were also sown with untreated seed. No difference was noticed between the treated and untreated plots as regards rate of germination or rate of subsequent growth. When the grain was in ear twenty plants were taken at random from each plot and the average of stalks per plant was determined. The results were as shown in the accompanying table.

These results show that nitrate of ammonia is more effective than the sulphate in increasing the tillering power of wheat and point to the desirability of investigation on a more extensive scale.

Variety	Average tillering power		Increase	Percentage increase
	Treated	Untreated		
<i>Varieties treated with sulphate of ammonia</i>				
Hunter's White	7.5	6.4	1.1	16
King's White	6.5	5.6	0.9	14
Bordier	12.4	11.4	1.0	8
Totals	26.4	23.4	3.0	Average 12
<i>Varieties treated with nitrate of ammonia.</i>				
Red Tuscan	10.5	10.0	0.5	5
Solid Straw Tuscan.	10.1	7.6	2.5	33.4
White Tuscan	8.3	6.7	1.6	23.4
Glynus	7.0	6.3	0.7	11.1
Pearl	8.0	5.8	2.2	37.9
Totals	43.9	36.4	7.5	Average 20.6

996 — **New Blight-proof Variety of Potatoes.** — *Queensland Agricultural Journal*, Vol. II Part 2, pp. 103-106. Brisbane, August 1914.

A new variety of potatoes called the "New Era" has been obtained by a farmer who is also a keen student and observer, Mr J. G. Harris of Raetihi, New Zealand. In the locality in which the potato was produced it has proved blight and frost proof; it is suitable to grow for the early potato trade and, it is stated, has produced up to 20 tons per acre.

The origin of this potato is as follows: six years ago Mr. Harris had an acre and a half in potatoes, Eldorados and Northern Stars. The potato blight swept the whole crop with the exception of one plant. Its tuber were multiplied during the next five years, and proved resistant to blight while the above-mentioned varieties, as well as Irish Rock, Up-to-date and Gamekeeper (1), were all attacked.

997 — **Grasses at Hawkesbury Agricultural College, New South Wales.** — BREAKWELL, J. (Agrostologist) in *The Agricultural Gazette of New South Wales*, Vol. XXV, Part pp. 653-656 + 11 figs. Sydney, August 1914.

Although the soil at Hawkesbury Agricultural College is not of a good character there are many grasses which stand the adverse conditions remarkably well.

The principal of these are: *Eragrostis leptostachya* Steud. (Paddock Love-grass), a native grass, particularly adapted to soils of a light or sandy nature; it is a heavy seeder and the seeds appear capable of

(1) See also No. 791, B. August 1914.

mination. *Eragrostis curvula* and *E. curvula* var. *valida* have recently introduced from America and are particularly adapted to growing under adverse conditions, such as light soils and low rainfall; produce, however, a coarse fodder. The latter of the two has a thick about 3 feet high and seeds heavily.

Droopogon intermedius (Blue grass). This is a native grass; its habitat alluvial formations or on moist black soils in general; nevertheless it is particularly adapted to the poor soil of the College. The grass is a very seeder, but so far the seed has not germinated very well; on the other hand root planting has been very successful. It yields a heavy flag, which remains green from September well into May. It is sensitive to frosts. At the College it is often attacked by a fungus (asp.).

Arachniifera (Texas Blue grass), is the most vigorous of the grasses and appears well adapted to the light soils. Propagation by seed is uncertain, but it readily spreads if root planting is resorted to.

Pratensis (Kentucky Blue grass). — It quickly covers the ground. At the College it suffers very much in the summer.

Semipervirens (Evergreen-Meadow grass). — This grass is really a variety of *Poa nemoralis*; it remains perfectly green during the heaviest frosts, and it grows fairly vigorously during the colder months of the year. Its texture is also finer than that of most of the other Poas.

Compressa. — Although this grass produces only a small quantity of seed, it is very nutritive and remains green during the greatest part of the year. Its vigour at the College shows its adaptability to poor soils, and its capability of enduring a limited rainfall is shown by its persistence at the Cowra Experiment Farm.

Minia fulva (Sugar grass). — A native grass; its flag is very succulent; it is particularly drought resistant; it will also stand a large amount of frost off. At Hawkesbury, however, the production of seed has been rather disappointing.

Bromus inermis (Awnless Brome grass). — This is a native of Europe, a grass which has met with great success in the United States of America. It remains green the greater part of the year and stands the summer drought better than *Bromus unioloides*. It is very nutritive and stands grazing well.

Bromus unioloides (Prairie grass). — A very succulent grass, which produces a large quantity of feed during the cooler months of the year. In cultivation it yields heavily, and when cut for hay the new plants come from the old root, becoming perennial in habit; but when stocked it appears rather suddenly, behaving as an annual.

Bromus pumellianus. — This is one of the newer bromes. It has made a promising growth, while *B. sterilis*, *B. maximus* and *B. mollis* have proved useless.

Lolium gayana (Rhodes grass). — Having already proved successful, the cultivation of this grass has spread rapidly; for producing the quickest growth on the lighter soils, it appears to have no equal. It seeds heavily.

Chloris barbata (Australian Rhodes grass), *Paspalum dilatatum*, *Setaria nigrirostris*, which has given good results in the Transvaal; at College it has grown vigorously, while at the same time its flag does become coarse.

Phalaris bulbosa is one of the best winter grasses introduced to College.

Festuca elatior does well on the poor soils of the College and in the dry summers fairly well.

F. arundinacea is largely cultivated in New Zealand.

F. ovina, *F. rubra*, and *F. duriuscula*. — All these grasses will grow in light soils, but they have finer leaves and smaller growth than the previously named.

998 — **Senegal Perennial Rice (1) as Forage.** — WOOD, C. E. (Manager, Kamerunga Nursery) in *Queensland Agricultural Journal*, Vol. II, Part 2, pp. 154-157. Brisbane, August 1914.

Mention having been made of the existence of a perennial rice in Senegal, French West Africa, the Queensland Department of Agriculture procured a small parcel of seed which was tried at the Kamerunga Nursery. The germination of a parcel of seed received in 1911 was fairly good; planted out in the open in January it was in flower at the end of May.

Perennial rice is a good forage, relished when green by cattle and sheep, and it also yields a good hay. It has, however, the drawback of producing only a very limited quantity of seed. The panicles are few and bear two to ten grains, the other glumes being empty. Owing to the smallness and leanness of the grain it is not likely to be of any use for human consumption in its present form in Queensland.

999 — **Drought-resistant Grasses and Fodder Plants.** — BREAKWELL, B. A. in *Agricultural Gazette of New South Wales*, Vol. XXV, Part 5, pp. 385-386. Sydney, 1914.

The exceptionally dry summer through which the interior of New South Wales has just passed provided a good opportunity of investigating plants which best endured the drought.

It was observed that of the plants growing in the Experiment 1 the following, tabulated in order of drought resistance, were the most prominent grasses: *Panicum bulbosum* (Experiment Farms at Wagga, Bathurst and Cowra), introduced from America.

Panicum polatum — Coolah grass (Wagga, Bathurst, Nyngan).

Andropogon bombycinus — Silky heads (Wagga).

A. intermedius — Rare blue grass (Cowra and Nyngan).

A. erianthoides — Satin top grass (Cowra).

Panicum floridum — (Cowra, Bathurst and Wagga).

Chloris gayana (Wagga, Nyngan and Cowra).

Poa arachnifera — Texas blue grass (Cowra and Bathurst).

(1) See No. 802, B. March 1911.

other fodder plants :

Medicago media — Sand lucerne (Wagga and Nyngan). This lucerne is a cross between the yellow-flowered lucerne (*Medicago falcata*) and the common lucerne (*M. sativa*), and in power of drought resistance is the characteristics of the former. It also differs from the ordinary lucerne in having a procumbent growth; this renders it more suitable for use than for hay, but makes it a poorer seeder than Tamworth lucerne.

Astragalus Sanguisorba — Sheeps' burnet (Wagga).

Medicago dasycarpa — (Bathurst).

Cowpeas (*Vigna catjang* Endl; *Vigna unguiculata* Walp.) in New South Wales. — HADFIELD, J. W. (Instructor in Agriculture, Hawkesbury Agricultural College) in *The Agricultural Gazette of New South Wales*, Vol. XXV, Part 8, pp. 657-1-2 plates. Sydney, August 1914.

The cultivation of cowpeas is spreading from year to year in New South Wales, where it began to become general between 1890 and 1892. In the early development the Department of Agriculture cooperated by distributing large quantities of seed in small lots. It is now distributed freely all the warmer parts of the State, though the production of seed is largely confined to the North Coast District.

As a rule the crop is sown in rows 2 ft. 6 in. to 3 ft. apart and the seed 5 to 9 in. apart in the rows. This enables the crop to be cultivated. Sowing with a drill is much better than broadcasting and harrowing in, in this case heavy rain falls a quantity of seed may become exposed and does not germinate. As with other legumes, nodules form on the roots of cowpeas, whence frequently the second and successive crops succeed better than the first, and but rarely require nitrogenous manures of any kind. In manurial trials at the Hawkesbury College phosphoric acid was found to be the most important manurial ingredient. Sulphate of potash, which increased the yields, was too expensive, while nitrate of soda and nitrate of ammonia were decidedly detrimental, reducing the yield to less than half that of the unmanured plots.

The varieties of cowpeas are very numerous. The Black is the most common, while the Poona, a variety introduced from India, has rivalled the Black at the College in the production of green fodder, but when grown for seed it does not ripen its pods so evenly. Both are maturing, while the White or Black Eye and the Upright-growing varieties; the Iron is a mid-season variety and it is claimed to be immune from the attacks of eelworms.

Cowpeas form a very valuable green manure crop for orchard and garden work, though it is difficult to plough the vines in. At Hawkesbury it is usual to roll the crop first, and then after running over it with a cultivator to plough it in with a single-furrow disk plough. The crop should be ploughed in soon after the pods are set, as at a later stage the vines become woody. Considering its very high feeding value, the writer considers ploughing in the whole crop as being sometimes a very wasteful practice. If the crop be fed off on the ground where it is grown, at least

50 to 75 per cent. of the manurial value will be returned, while the feeding value of the crop will also have been obtained.

As fodder crop, cowpeas give a better balanced and somewhat abundant fodder when they are grown with maize, or still better with sorghum and millet.

A system that has proved very profitable on the North Coast is to sow the cowpeas down between the rows of early corn. They are sown with a maize dropper immediately after the last cultivation of the corn, and should be not later than January if it is intended to harvest the crop for seed. Yields of 10 bushels per acre are quite common, and some even 16 bushels.

Cowpeas by themselves usually form an inferior kind of silage, being acid in character and poor in colour and smell, and more or less decomposed. They are much better when mixed with sorghum, maize or millet. American experience indicates that the best plan is to broadcast the cowpeas at one bushel per acre, and the sorghum or kaffir corn at about 10 bushels of seed per acre.

If cowpeas have to be cut and turned into hay a difficulty is met with as there is no satisfactorily rapid method of harvesting. Machinery for the purpose has been devised, but hitherto without much success. It makes good hay, but its leaves fall very readily when dry and with the greatest care the loss will be considerable. The upright-growing variety such as Poona and Upright-growing, especially when grown thickly, is harvested with a scythe and sometimes with a mower.

No machinery for the purpose of harvesting the pods has been perfected, and with present methods the whole plant has to be harvested and threshed, or the pods picked by hand. Three cwt. of these peas in give, when threshed, one bag of peas weighing 240 lb.

The sale prices of cowpeas in New South Wales have been practically stationary during the last twenty years, namely, for the Black or about 10s per bushel on the Rivers and about 12s 6d. delivered at the seedsmen. The average retail price for cowpea seed is about 1s per bushel. The price of Poona, which has a very small seed, is something over 2s per bushel.

1901 - **Flax Experiments in Ireland.** — *Department of Agriculture and Instruction for Ireland, Journal*, Vol. XIV, No. 3, pp. 515-534. Dublin, 1911.

Manurial experiments. — The following is a summary of the results obtained from the two series of experiments conducted by the Department during the eight years 1901 to 1908 inclusive:

1. The use of potash manures gave profitable increases; kainit and chloride of potash showed almost equal merits, were more regular in effects and, on the average, gave better results than sulphate of potash.
2. The application of kainit and chloride of potash in winter gave results as good as when these manures were applied at the time of sowing.

(1) See also No. 825, B. March 1914.

3. Phosphatic manures, when applied either singly or in combination with a potash manure, or as part of a complete mixture, encouraged the growth of weeds at the expense of the flax, and their use was almost invariably attended with a loss, and very frequently even with smaller yields of scutched flax.

4. In some seasons profitable increases were obtained from the addition of the nitrogenous manure, rape meal, to kainit. Its effects, which appeared to depend on the nature of the season, were too irregular to warrant the general adoption of such a mixture in preference to the kainit chloride of potash dressings now so commonly used.

5. The application of agricultural salt was not remunerative.

As in these two series of experiments the results obtained from the addition of a nitrogenous to a potassic manure were very irregular, it was considered advisable to carry out a third series of experiments with sulphate of ammonia added in varied proportions to chloride of potash. Still further, as the application of phosphates as superphosphate or basic slag suited in a loss, it was also decided to test bone flour as part of a complete mixture.

This third series of experiments was started in 1909 at ten centres and repeated in 1910 and 1911 in eight and nine centres. The following results per statute acre were tested:

Plot 1. — Unmanured.

2. — $\frac{1}{2}$ cwt. chloride of potash.
 $\frac{1}{2}$ cwt. sulphate of ammonia.
3. — 1 cwt. chloride of potash.
 $\frac{1}{4}$ cwt. sulphate of ammonia.
4. — 1 cwt. chloride of potash.
 $\frac{1}{2}$ cwt. sulphate of ammonia.
5. — 1 cwt. chloride of potash.
 $\frac{1}{4}$ cwt. sulphate of ammonia.
 2 cwt. steamed bone flour.
6. — 1 cwt. chloride of potash.

Whilst in 1911 the summer was extremely warm and dry, in 1912 it was abnormally wet and cold.

The average results per acre from the application of the different manures to the flax crop were as follows:

Number of plot	1	2	3	4	5	
Yield of retted flax . . .	3 229 lb.	3 614 lb.	3 593 lb.	3 739 lb.	3 494 lb.	3 185 lb.
Yield of scutched flax, . . .	33 st. 12 lb.	38 st. 11 lb.	37 st. 5 lb.	39 st. 13 lb.	31 st. 2 lb.	35 st. 1 lb.
Yarns from flax and tow	£14 8s. 8d.	£16 13s. 5d.	£16 3s. 0d.	£17 12s. 9d.	£12 19s. 9d.	£14 16s. 9d.
Cost of manure	—	12s. 6d.	13s. 6d.	17s. 6d.	£1 4s. 3d.	10s. 0d.
Estimated profit from use of manures	—	1 12s. 3d.	£1 0s. 7d.	£2 6s. 7d.	£2 13s. 2d. (loss)	1s. 11d. (loss)

In valuing these results it must be borne in mind that contrary to usual experience the flax on the unmanured plots in 1912 showed no sign of yellowing, which caused the advantage derived from chloride of potash alone (Plot 6) to disappear.

Plots 2 and 3 showed a profit over Plot 6 in the years 1909, 1910 and 1912 and a loss in 1911; Plot 4 yielded a profit in 1910 and 1912 and a loss in 1909 and 1911. These different results cannot be attributed to the respective fertility of the various soils; it appears more probable that they are due to the climatic condition of the seasons. No definite recommendation can therefore yet be made as to the use of sulphate of ammonia with chloride of potash. Plot 5 showed that when given under the form of bone flour phosphates caused a loss: they favoured the growth of weeds and diminished the yield in scutched flax.

Liming experiments. — An experiment designed to test the value of liming was made on four plots, each one quarter of an acre in extent. After the application of the lime in 1911 all plots were cropped with oats and in 1912 with flax.

The treatment of the respective plots per acre was as follows:

Plot	1911 Oats	1912 Flax
1.	no lime	no chloride of potash
2.	no lime	1 cwt. do. do.
3.	1 ton burnt lime . . .	no chloride of potash
4.	1 ton burnt lime . . .	1 cwt. do. do.

The average results per acre are shown in the following table:

Number of plot	1	2	3	4
Yield of retted flax	2 724 lb.	3 142 lb.	2 896 lb.	3 343 lb.
Yield of scutched flax . . .	37 st. 8 lb.	44 st.	42 st.	47 st. 8 lb.
Value of scutched flax . . .	£16 3s. 2d.	£18 6s. 9d.	£18 6s. 9d.	£20 15s.
Cost of manure	—	10s.	5s.	15s.
Estimated profit	—	£ 1 3s. 3d.	£ 2 2s. 1d.	£ 3 1s.

Seed trials. — Each year since 1901 experiments have been conducted with seed imported by the Department of Agriculture for Ireland from Holland and Russia, in comparison with Dutch and Russian seeds imported by Ulster merchants. The results are given in the following table:

	Russian seed imported by the Department	Belfast brand of Riga seed	Dutch seed imported by the Department	Belfast brand of Dutch seed	Irish seed 2nd. year of selection
average 1901-1911, excluding 1903. Yield scutched flax per c.	£14 15s. 6d.	£13 17s. 0d.	£14 11s. 5d.	£13 11s. 6d.	—
Yield of scutched flax per acre	£14 8s. 7d.	£14 4s. 6d.	£15 1s. 0d.	£14 3s. 6d.	£8 18s. 8d.
Yield of scutched flax per acre	35 st. 1 lb.	34 st.	38 st.	36 st. 1 lb.	22 st. 3 lb.

From these and preceding experiments the conclusions may be drawn that the variety of flax seed to be sown (whether Dutch or Riga) should be governed by the class of soil for which it is intended but by the fertility of the seed itself, which depends on the climatic conditions prevailing in the seed-producing countries. Thus in 1910 and 1911 Russian seed gave the better average results on the various classes of soil, while in 1909 and 1912 the Dutch seed proved the more productive. Farmers should, therefore, before purchasing seed, consult the leaflets of the Department which give information as to the harvest conditions during the previous year in Holland and Russia.

In comparative seed tests, "Pernan Crown" seed, another seed selected and grown on a farm in Russia for a number of years, Irish seed and Dutch seed were tested. The first gave, on the whole, better returns than the second, and both better than the Dutch Riga Child. The crops from the selected Irish seed were much inferior.

Other tests were made with Irish seeds saved from the same crop, but at different stages of maturity. The perfectly ripe seed yielded 41 st. 10 lb. of scutched flax per acre, or 16.72 per cent. of the retted straw, the average returns of flax and tow per acre being £18 16s. 9d. The immature seed yielded 39 st. 10 lb. of scutched flax, or 16.60 per cent, and the total value of flax and tow was £15 19s. 7d. The higher return from the crop produced by the ripe seed is mainly due to the superior quality of the fibre.

In 1911 tests were commenced and will be continued on a large scale with a view to determining if it be possible to produce flax seed successfully in Ireland and to improve it for fibre production by selecting from good stalks. It has been observed that seeds detached from the stalks in the autumn and stored in granaries lost in germinative qualities, and that it is preferable not to ripple it until the following spring and to store the dried flax straw in small lots during the winter in lofts with open windows so that all the seed boll ends are exposed to a current of air. This straw was rippled in the latter end of February.

A definite conclusion cannot yet be drawn from these experiments. The following table shows the selected Irish seed yielded less than the Pernan Crown, but a scutched flax of higher value.

	Selected Irish seed	Perman Green seed
Yield of dried retted straw per acre	25 cwt. 1 qr. 4 lb.	26 cwt. 1 qr. 2
Yield of scutched flax per acre	33 st. 2 lb.	36 st. 9 lb.
Percentage of scutched flax from retted straw . .	16.38	17.02
Value of scutched flax per cwt.	8s. 2d.	76 s.
Value of scutched flax per acre	£16 16s. 3d.	£17 2s. 6

1002 - Contribution to the Study of the Lodging of Hemp. — HANSCHE, HEDD
in *Mitteilungen der landwirtschaftlichen Lehranstalten der K. K. Hochschule für B
kultur in Wien*, Vol. II, Part 4, pp. 607-674. Vienna, August 8, 1914.

This study contains a detailed account of the cultural condition of the experiment and the results of the examination of the hemp stems, the observations and measurements taken during growth, microscopic examination of the stems, determination of resistance to lodging, chemical analysis.

The possibility of lodging depends on the lower portion of the stem and it is necessary to consider the histological conditions in this region in order to judge the resistance of the stem. Transverse sections at the base of lodged plants show a reduction of lignified fibres, and an increase of parenchyma. The pith is also generally more abundant in lodged stems and the lignified fibres are often arranged symmetrically, thus reducing mechanical resistance along the line of symmetry. The histological differences between lodged and unlodged plants disappear in the upper portions of the stems.

The cells of the fibrous tissue of lodged plants are smaller, round with a larger lumen. The fibres are smaller and less dense. As a result of lodging the growth of the cells is checked and they remain diminutive. The relative thickness of the cell-walls diminishes with lodging, only in the lower portion of the stem. As a result of direct determination of the resistance of the stems, it appears that the mechanical constant of the tissues are not influenced by the thickness of the cell-walls of the stem.

Lodging considerably diminishes the mechanical resistance of the stems; the resistance of the stems to lateral forces is directly proportional to their weight, provided the thickness of the cell-wall is not abnormal. It has not been found that the degree of lignification has any influence on the power of resistance of the cells, though it is certainly greater on the lower portions of the stem.

Lodged plants show a higher percentage of ash. The percentage of silica diminishes from the base to the top of the stem and is greater in lodged plants, but as its total quantity is so small it cannot have any effect on the resistance to lodging; similarly also with regard to the percentage of calcium.

Hemp Production in the United States. — *Daily Consular and Trade Reports*, issued by the Bureau of Foreign and Domestic Commerce, Year 17, No. 177. Washington, July, 30, 1914.

The falling off in the domestic production of hemp is due primarily to increasing difficulty in securing sufficient labour to take care of the crop, the lack of labour-saving machinery, to the increased profits in raising wheat, tobacco and corn, and lastly to the rapidly increasing use of other fibres, especially of jute.

During the past three years interest in the hemp industry has been renewed, and experiments are being tried with a view to the cultivation of the crop in new areas, such as large extents in the valley of the Mississippi and its tributaries, and in the Sacramento and San Joaquin Valleys in California.

Hemp cannot be economically grown in areas of less than 50 acres in any one locality, so as to warrant the use of machinery for harvesting and marketing.

The following is a general estimate of cost and returns for such an area of 50 acres :

	\$
Ploughing (in fall) 50 acres, \$ 2 per acre	100
Disking (in spring), 50 cents per acre	25
Harrowing, 30 cents per acre	15
Seed, 40 bushels, delivered, \$ 4.50 per bushel	180
Seeding, 40 cents per acre	20
Rolling 30 cents per acre	15
Self-rake reaper for harvesting	75
Cutting with reaper, \$ 1.50 per acre	50
Picking up from gavels and shocking, \$ 1 per acre	50
Spreading for retting, \$ 1.50 per acre	75
Picking up from retting swath and setting in shocks, \$ 1.40 per acre	70
Breaking 50 000 lbs. fibre, including use of machine brake, $1\frac{1}{2}$ cents per lb.	750
Baling 125 bales (400 lbs. each), including use of baling press, \$1.40 per bale	175
Marketing and miscellaneous expenses	150
Total cost	\$ 1 750
Long fibre 37 500 lbs., 6 cents per lb.	2 250
Tow 12 500 lbs., 4 cents per lb.	500
Total returns	\$ 2 750

Cotton in Paraguay and Argentina. — *Boletín del Departamento Nacional de Fomento*, Year 1914, No. 5, pp. 5-31. Asunción, May-June, 1914.

The results of an enquiry on the cultivation, marketing and trade in cotton made by the "Departamento Nacional de Fomento" of Paraguay are here presented.

Cotton in Paraguay. — Suitable cotton soils are plentiful in Paraguay and the crop was formerly grown in all districts. According to statistics for 1863 the yield was nearly 5 000 000 lbs. of ginned cotton. All the best varieties except Caravonica have been tried in Paraguay, and it has been found that the tree cottons are more suitable to the climate

especially *Gossypium barbadense*, with *G. peruvianum* and *G. maritimum* which are really varieties of it. These like abundant rains, and Paraguay is more favoured in this respect than any other cotton-growing country. Good results have also been obtained at some places, in particular at the Agricultural Experiment Station of Puerto Bertoni, with varieties of *G. herbaceum*, especially Peterkin, Hawkins, and Allen. These varieties succeed in places where the others will not do, as in poor shallow soils. *G. barbadense rufum*, known in Paraguay as Mandipwita, is indigenous. It is used to a certain extent in the industry and sometimes makes a good price. If a steady market could be obtained for it, this species of cotton would be of great importance, since it yields well and is more resistant than other species.

Seeding is effected from June to the beginning of September; if sowing is late the yield of the first crop is reduced, but the second is much greater. Sr. M. S. BERTONI made a successful experiment of sowing in January and February between rows of maize; if the maize is not sown too thickly the cotton grows well, though slender, and is protected from cold. If cold weather prevails after the maize is harvested, the cotton is cut down to the ground, but if there is no likelihood of frost the young plants are left as they are. When the warm weather returns they grow rapidly and at the end of November the bolls begin to ripen.

Harvest begins in December, or January, or at the latest February for the first year's crop and continues until the cold season or, if there is no fear of frosts, until June or July when the flowering period ceases and the growth of the branches begins. In districts exposed to frost the plants are cut back in May, and the unopened bolls are collected and dried in the sun until they open: these pods yield the cleanest cotton.

Sr. Bertoni considers the yield per acre in Paraguay as the highest in the world, the average yield of the country being 534 lbs. per acre. At the experiment station at Puerto Bertoni he has obtained yields of 710 to 800 lbs. per acre of ginned cotton.

The following figures show the comparative yields of the different countries (in lbs. per acre):

	Minimum	Average	Maximum
Italy and Spain	68	135	225
Africa	90	180	360
United States	126	200	604
Argentina	180	305	630
Paraguay	360	540	923

In spite of natural conditions so favourable, the cultivation of cotton has not been seriously developed owing to a number of social factors.

Cotton in the Argentine Republic. — The following data have been obtained from the "Dirección General de Comercio e Industrias" of the "Departamento de Fomento" of the Argentine.

Almost all the Argentine cotton is produced in the region of the Rio Paraná in loamy soils; the rainfall is 80 to 150 cm. (32 to 60 in.), fairly well

1. The common varieties grown are Texas Woods, Culpeper, Sim-King, Russell, Peterkin, Allen, etc., all of American origin and of staple. The "Departamento de Fomento" has begun a policy for standardisation of the cotton of Chaco. The estimated area of cotton is about 7000 acres; it would have been much greater but for the devastations of locusts and prolonged drought. The average yield is about 1340 lbs. per acre of raw cotton, but of recent years it has been about 1080 lbs. per acre. Unginned cotton is bought by local merchants, ginned and packed for export. The seed is partly exported and partly locally for oil extraction. Under normal conditions an acre of cotton is a profit of £3 10s to £5 10s; the initial expenditure, together with the cost of seeding and picking, may be estimated at the same sum. On account of the scarcity of labour, the extension of this crop presents difficulties.

The Indian Jute Industry. — *The Agricultural Gazette of New South Wales*, Vol. XXV, Part 7, pp. 577-580. Sydney, July 1914.

The following data are taken from a report drawn up by J. B. SUTTON, who was instructed by the Minister of Agriculture of New South Wales to visit the jute-producing districts of India.

India has practically a monopoly of the production of jute, the result of which is that the market fluctuates to a great extent and is subject to much speculation. The world's annual demand for raw jute is estimated by the Commercial Intelligence Department of India at about 1 700 000 tons; 600 000 tons is the estimated mill consumption; the surplus is exported to the following countries:

England	340 000 tons
Germany	180 000 "
U. S. America	124 000 "
France	86 000 "
Other countries	179 000 "
Total	909 000 "

The jute manufactures represent 40 per cent. of the total value of exports of Indian manufactures, and the raw jute over 26 per cent. of the value of Indian raw materials exported. During the financial year 1912-13 the exports of jute fabrics to the principal countries were as follows:

	Amount £	Principal form of export
U. S. America	5 840 333	Cloth
Argentina	1 944 687	"
Australia	1 433 733	Bags and bales
England	960 933	" " cloth
Chile	564 067	Bags
China	530 200	"

The above countries are followed in decreasing order by Canada, Egypt, West Indian Islands, Straits Settlements, etc.

Bengal is the chief jute-producing centre of India. The area under jute is estimated at 3 400 000 acres and that an average crop yields about 1000 lbs. of jute fibre per acre, the quality of which is largely governed by soil and climatic conditions. The most satisfactory results are obtainable from rich loams provided with plenty of moisture. Jute is mostly grown in small holdings and solely worked by natives. The soil is frequently ploughed several times to pulverize it thoroughly before sowing. No special care appears to be bestowed on seed selection. The sowing takes place from February to April, broadcasting being generally adopted, about 8 lbs. of seed to the acre are used. While moisture is necessary the jute areas are not irrigated except in cases where there is a falling in rainfall or a great absence of humidity.

When the crop is about to flower, it is harvested. The stalks are cut generally from 4 to 12 feet high or even more, according to climatic conditions. The harvesting takes place from June to August and sometimes up to September. The bundles of jute stems are submerged in water to rot for 10 or 15 days; then the fibre is removed from the core by hand with the help of very primitive implements, after which it is dried and bleached in the sun for two or three days.

The fibres are collected in small bundles and are then ready for sale. There are usually three middlemen between the grower and the mill or manufacturer. The bales for the local mills weigh 330 lbs. and those for exportation 400. The raw jute is classified as follows:

No. 1 quality, 80 to 90 per cent. suitable for Hessian warp and 10 to 20 per cent. of weft.

No. 2 quality, 60 to 70 per cent. of the former, and 30 to 40 per cent. of the latter.

No. 3, 70 per cent. of sacking warp and 30 per cent. of weft.

No. 4, 40 per cent. of weft.

For foreign markets the standard quality is usually quoted as "group or 'cracks'", and means an equal proportion of No. 2 and No. 3 qualities.

Besides the above there are also lower grades called "cuttings" or "rejections".

In the mills the jute passes first of all through a softening machine with fluted rollers; it is then carded and spun. Thence it proceeds to looms and when woven it passes through a callender with rollers heated up to 600° F., giving a smooth surface. In the case of cloth for bales, the fabric passes through another machine known as the "cropper" which removes any loose fibres from the surface of the cloth in order to avoid any jute fibre getting mixed with the wool.

1006 - Composition of Essence of *Artemisia arborescens* and of *A. Absinthium* collected in Italy. — 1. JONA, T., in *Annali di Chimica applicata*, Vol. No. 3 and 4, pp. 63-68. Rome, 1914. — 2. PAOLINI, V., and LO MONACO, R., in *Rendiconti di scienze fisiche, matematiche e naturali della Reale Accademia dei Lincei*, Vol. XXIII, Part 4, pp. 123-129. Rome, August 16, 1914.

I. — The essence of *Artemisia arborescens* was obtained by the distillation of the dried tops collected near Sassari (Sardinia), a little before flowering.

The yield was 0.57 per cent. of essence, with the following characters: blue colour, aromatic, slightly mobile, density at 15° 0.9458, soluble volumes of 80 per cent. alcohol and in all proportions of 90 per cent. alcohol, contains no nitrogen or sulphur, saponification value 29.3, acid 9.8, etherification index 19.5. At normal pressures the essence is between 90° and 210° C.

According to the researches of the writer it contains: a) 13.94 per cent. of alcohol of the formula $C_{10}H_{18}O$ (thuyol and a small quantity of α -ter alcohol, probably borneol), 8.58 being free and 5.36 combined with acids; b) formic, acetic, isovalerianic, pelargonic, palmitic and stearic partly in combination with the above-mentioned alcohols; c) about 1 per cent. of β thuyone; d) a mixture of hydro-carbons of high boiling point.

1. — Essence of *Artemisia Absinthium* obtained from fresh cultivated plants grown near Rome and Perugia, by distillation in a current of vapour the following analysis: a) about 10 per cent. of thuyone, consisting of isomeric β dextro-rotary and the isomeric α thuyone; b) about 48 per cent. of thuylic alcohol, free and in combination with acetic, isovalerianic and palmitic acids; a mixture of at least two chemical compounds in which the dextro-rotary δ thuylic alcohol predominates; c) phellandrene; d) cadinene; blue oil of unknown composition.

- Two Crosses of Strong Tobacco in Italy. — ARELLI DONNARUMMA, in *Bollettino tecnico della coltivazione dei tabacchi*, Year XIII, No. 1, pp. 7-8. Scafati, January-February 1914.

With a view to improving the type of plant and the shape of the leaves strong hybrids obtained by crossing "Italia" tobacco with Kentucky Salento \times Kentucky, crosses were made between the two hybrids themselves. The parental forms were immune from *Thielavia basicola* which does so much damage to Kentucky tobacco. Four of the typical hybrids were selected, two of each kind, and reciprocal crosses were made. Thirty pairs were crossed and 30 seed capsules obtained. In the following year the two hybrids Italia-Kentucky \times Salento-Kentucky and Salento-Kentucky \times Italia Kentucky, were grown in land freely infested with disease and in which the Kentucky variety had failed during previous years. Although the season was not very favourable the two crops succeeded admirably. No plant showed the least attack of *Thielavia*, and the growth so rapid that they considerably out-grew the rows of control plants in the centre of the plots.

The object of the cross was completely attained in the new hybrids, which combined the length of leaf of the Italia-Kentucky parent and the width of leaf of the Salento-Kentucky parent. The characters of the parents were so completely combined in the offspring that it required an experienced eye to distinguish between the reciprocal crosses. Cultural experiments will be made to ensure constancy of type.

In this preliminary study the following determinations were made on different parts of the plant after drying in a water oven: ash, total nitrogen, nicotine, organic acids, ether extract, alcoholic extract. Ordinary methods were used except in the case of nicotine, for which a slight modification of Keller's process was preferred on account of its rapidity: the nicotine was displaced by 20 per cent. potash and extracted by a mixture of 5 parts of sulphuric acid and petroleum ether, then titrated against $\frac{N}{10}$ sulphate of cerium.

Parts analysed	Ash	Total nitrogen	Nicotine	Organic acids	Ether extract	Moisture
Leaves from middle and lower portion of plant.	whole 10.50	2.86	1.18	3.56	8.01	2.0
	blade 10.40	2.92	1.23	3.47	8.30	2.0
	ribs 10.60	2.02	0.80	4.01	5.06	16.0
	complete 11.10	4.30	0.89	3.36	9.21	24.0
Apical leaves	blade 12.45	4.70	0.91	3.45	9.45	25.0
	ribs 10.55	2.08	0.81	4.01	5.00	16.0
Stems	6.40	1.25	0.29	3.65	2.40	21.0
Roots	6.85	1.69	0.65	4.23	1.85	18.0

with congo red as indicator. The organic acids were displaced by succinic acid 1:3, extracted with ether, titrated against soda using phenolphthalein as indicator, and expressed as oxalic acid.

The seedlings were analysed as a whole as well as in portions, and gave results as shown in Table I.

The analyses of the plant before flowering are given in Table II.

The leaves harvested at the 1st (basal), 2nd, 3rd and 4th (apical) pickings were analysed whole and in parts (blades and ribs). The bare stems and roots remaining in the field were also analysed. The results are set out in Table III.

TABLE III — *Analyses of leaves of the various pickings.*

		Ash	Total nitrogen	Nicotine	Organic acids	Ether extract	Alcohol extract
seedling	whole leaves . .	16.10	1.57	1.42	4.61	9.95	32.15
	blades	16.40	1.69	1.56	4.50	10.15	32.75
	ribs	14.70	1.23	0.46	4.64	4.90	24.95
young plant	whole leaves . .	12.30	1.00	1.52	4.52	10.00	34.15
	blades	12.35	1.02	1.94	4.50	10.40	40.55
	ribs	12.10	0.77	0.73	4.54	4.90	27.35
ripe plant	whole leaves . .	8.55	1.26	0.75	3.75	9.65	45.10
	blades	8.25	1.35	0.84	3.52	10.40	46.05
	ribs	9.80	0.96	0.24	3.91	3.15	33.60
mature plant	whole leaves . .	7.50	1.50	0.74	4.07	10.80	43.25
	blades	7.20	1.58	0.81	3.76		
	ribs	9.00	1.34	0.32	4.95		
stems		6.40	0.55	0.19	3.92	1.80	10.20
roots		7.40	0.72	0.16	7.78	1.25	8.60

These results show that :

1. Seedlings are richer in ash, nitrogen and organic acids than half-ripe or full-grown plants.
2. In plants before flowering, the apical leaves are richer in ash, nitrogen, and substances soluble in ether and alcohol than the lower leaves, they contain less nicotine and organic acids.
3. In ripe leaves, the ash content decreases from the basal (1st picking) to the apical leaves (4th picking), and the leaves of the 1st and 2nd pickings are also richer in nicotine, containing double the quantity of the leaves of the 3rd and 4th pickings.
4. The leaf blades are always richer in nitrogen, nicotine and substances soluble in alcohol and ether than the ribs, and generally also in ash, they are poorer in organic acids.

5. The stems and roots contain less ash, nitrogen, substances soluble in ether and alcohol, and nicotine than other parts of the plant, but roots contain more nicotine than the stems.

1009 — **The Cultivation and Collection of Medicinal Plants in England.** — WEADON W. A., in *The Journal of the Board of Agriculture*, Vol. XXI No. 6, pp. 492-510 + 13 London, September 1914.

The cultivation of medicinal herbs in England began in very ancient times and gained gradually in importance with the decrease of uncultivated lands and of wild plants. During recent years the acreage devoted to cultivation has been more and more restricted by competition with foreign products; nevertheless English drugs and essences have still the reputation which allows of their being sold at about four times the price of the Continental article.

The limited outlet for most drugs makes overloading the market a comparatively easy matter; prices then become excessively low for the producer, with the result of restricted production, which in its turn leads again to high prices. As an illustration the writer instances Belladonna in 1900 the supply of home grown Belladonna was in excess of the amount required for making green extract, and the price of the surplus leaves, after drying, was gradually reduced until being sold in competition with wild foreign supplies they were disposed of at a loss. The result was that cultivation was practically limited to four drug farms having facilities for making Belladonna preparations. But in 1912-13 there was an interruption in the continuity of Belladonna leaf and root exports from Croatia and Slavonia in South Hungary, the chief centres for foreign Belladonna; prices rose to such an extent that roots which realized 45s per cwt. in January sold for 150s before the end of August. Belladonna leaves from abroad which sell at normal times for 45s to 50s per cwt., are now unobtainable at 1s per lb. In order to avoid as much as possible such fluctuations the writer suggests adopting cooperation between growers and wholesalers.

The south of England is especially suited to drug growing and is therefore favoured by being close to the principal consuming market.

The writer then reviews the most important medicinal plants in England, namely:

Aconite (*Aconitum Napellus* L.). — The roots are mostly used, the leaves being of little importance. The chief collecting centres for the foreign roots are the Swiss Alps, Salzburg, North Tyrol and Vorarlberg; Spain still produces some also and Japanese root (usually ascribed to *A. Fischeri* Reiche) is plentiful.

Anise (*Rimpinella Anisum* L.). — It is cultivated at Westington, Chipping Norton, but the English climate is hardly warm enough to ripen the fruit properly and does not warrant further attempts at cultivation even if market conditions, should be favourable.

Belladonna (*Atropa Belladonna*, L.). — The plant grows wild in the southern counties of England. When cultivated it yields an average of 5 to 6 tons of fresh herb in the second and third years of 5 to 6 tons to the acre. A

is obtained in September in good seasons. It is sometimes attacked by small beetle, *Epirix atropae*. Paraffin and soap emulsion is stated to be his.

Caraway (*Carum Carvi*, L.). — Caraway is largely grown in the islands. In England it is mostly cultivated in Essex and Kent; it is naturalized in some parts of Lincolnshire.

Chamomile (*Anthemis nobilis* L.). — Belgium is the chief grower of plant. English chamomile is normally practically all used for distillation. The yield of dry flowers is about 4 cwt. per acre. From 5 to 6 lbs. of flowers yield 1 lb. of dry flowers.

Coriander (*Coriandrum sativum*). — Coriander is grown in Lincolnshire East Anglia, often in conjunction with caraway. It yields about 10 cwt. per acre. English-grown coriander has the reputation of possessing a most delicate flavour.

Dandelion (*Taraxacum officinale* L.). — Ordinarily English roots are in competition with German roots. The yield is about 4 or 5 tons of roots to the acre in the second year. A hundred parts of fresh root yield twenty-two of dry material.

Foxglove (*Digitalis purpurea* L.). — The Continental supplies come from Thuringia and the Harz mountains. It grows wild in England, is also cultivated by a few growers; the yield is about 1 to 2 tons of leaves per acre.

Dill (*Pencdanum graveolens* B. & H.). — It is grown chiefly in East Anglia, and produces from 5 to 7 cwt. of dill fruits per acre.

Fennel (*Foeniculum capillaceum* Gilibert). — The best fennel is supplied from France, Saxony and Russia. Fennel is largely used for cattle condiments. When grown in England it becomes an annual, and it would probably yield a crop of 15 cwt. per acre.

Golden Seal (*Hydrastis canadensis* L.). — Golden seal is an American plant. It was formerly so abundant in Ohio as to be considered a pestilent weed, but the drug collector and the improvement of land denuded the natural growing areas (deep shady nooks in forests with rich deep moist soil) and now the supply is so limited that the price has quadrupled since 1905. In England it appears to be grown only in one locality — the Wellcome Materia Medica Farm, near Darenth, Kent. It has also been successfully grown near Moscow in the shade of apple trees. In 1912 the United States Department of Agriculture reported that the cultivation of golden seal was "successfully established". After initial experiments commenced in 1899 by the above Department, 5120 lbs. of fresh roots per acre corresponding to 1500 lbs. of marketable roots, were obtained.

Henbane (*Hyoscyamus niger* L.). — This biennial is cultivated in England for the preparation of the extract; the dry commercial leaves imported from Germany and Russia are derived from the wild annual. Fresh leaves lose 80 per cent. of their weight on drying.

Egyptian Henbane (*Datura Metel* L.). — It thrives very well at the Wellcome Materia Medica Farm in Kent.

Opium Poppy (*Papaver somniferum* L.). — Though the crop is a precarious one, the white variety of opium poppy is still grown in several parts of England, notably Lincolnshire. Belgium ordinarily supplies a proportion of the poppy heads used in the United Kingdom.

Thorn Apple (*Datura Stramonium* L.). — It is not grown on a commercial scale in England; considerable amounts of the wild leaves are imported from Germany and Hungary. The demand for seed is very limited. About 34 parts of dry leaves are produced from 100 parts of fresh ones.

Datura Tatula is occasionally used in medicine in place of *D. Stramonium*.

Valerian (*Valeriana officinalis* L.). — Valerian is common in England in moist situations. Most of the rhizomes of commerce are grown in Lincolnshire or imported from Holland, Germany and France. About 24 parts of the dry product are obtained from 100 of fresh rhizomes.

Other Medicinal Plants.

Experimental growing of some American drugs such as senega, delia, pokeroot and lobelia is made at Darent.

Medicinal herbs for sale are cultivated at Carshalton. The following are regularly grown:

- Balm (*Melissa officinalis* L.).
- Comfrey (*Symphytum officinale* L.).
- Feverfew (*Chrysanthemum Parthenium* L.).
- Greater Celandine (*Chelidonium majus* L.).
- Germander (*Teucrium Scorodonia* L.).
- Marsh Mallow (*Althaea officinalis* L.).
- Mugwort (*Artemisia vulgaris* L.).
- Pennyroyal (*Mentha Pulegium* L.).
- Rue (*Ruta graveolens* L.).
- Southernwood (*Artemisia abrotanum*).
- Tansy (*Tanacetum vulgare* L.).
- Wormwood (*Artemisia Absinthium* L.).
- Yarrow (*Achillea Millefolium* L.).

Among the medicinal plants which grow wild in England and are, or might be, collected the writer mentions the following:

- Barberry (*Berberis vulgaris* L.).
- Bittersweet (*Solanum Dulcamara* L.).
- Broom (*Cytisus scoparius* L.).
- Buckbean (*Menyanthes trifoliata* L.).
- Burdock (*Arctium Lappa* L.).
- Centaury (*Erythraea Centaurium* Pers.).
- Coltsfoot (*Tussilago Farfara* L.).
- Elder (*Sambucus nigra* L.).
- Figwort (*Scrophularia nodosa* L.).
- Hemlock (*Conium maculatum* L.).
- Horehound (*Marrubium vulgare* L.).

Male Fern (*Aspidium Filix-Mas* Sw.), a very common fern in moist shaded stations; hitherto Germany (Harz and Thuringia) supplied all male fern rhizome or extract used in England.

Meadow Saffron (*Colchicum autumnale* L.).

Meadowsweet (*Spiraea Ulmaria* L.).

Mullein (*Verbascum Thapsus* L.).

Red Poppy (*Papaver Rhoeas* L.), the petals of which find a steady, limited market.

Sweet Flag (*Acorus Calamus* L.).

Yarrow (*Achillea Millefolium* L.), etc.

Other medicinal herbs, such as squirting cucumber and *Lactuca vi-rica*, are cultivated in a small way.

A bibliography of 20 works is given as an appendix to the paper.

- **New Garden Plants of the Year 1913.** — *Royal Botanic Gardens, Kew, Bulletin of Miscellaneous Information*, Appendix III. — 1914. 86 pp. London, 1914.

The number of garden plants described yearly is so considerable that it has been thought desirable to publish a complete list of them in the *Bulletins* each year. The present list comprises all the new introductions recorded during 1913. It includes not only plants brought into cultivation for the first time during 1913, but also the most noteworthy those which have been re-introduced after being lost from cultivation, new hybrids. The list contains 454 plants. Of each species or variety a description is given and the publication from which the description was obtained.

- **Pruning Hardy Shrubs.** — BECKETT, E., in *The Journal of the Royal Horticultural Society*, Vol. XI, Part I, pp. 24-34 + 8 figs. London, August 1914.

The growing of ornamental shrubs has developed greatly in the United Kingdom during the last 20 years and a great number of new species have been introduced from the Far East; most of them prove hardy and adapt themselves well to their new home.

The question of the most suitable pruning is very important in order to secure their maximum ornamental effect. The writer bases the following advice on his own long experience:

Shrubs that require but little pruning, except to keep them in a shapely position, are: *Arbutus Unedo*, which however, if it has been allowed to become straggling, can be safely cut back to within 2 or 3 feet of the ground; *Euonymus Macquii*; *Garrya elliptica*; *Escallonia* spp.; *Cassinia fulvida*; *Chrysanthemum chrysophyllis* which much resents being cut into the hard wood; *Coloneaster* spp., especially the new varieties introduced from China, and some of the older and more common varieties, for example *Simonsii*; *Microphylla*, may be cut to within a few inches of the ground if necessary; *Hydrangea* spp., which suffer much when cut back into old, hard wood; *Hydrangea crassifolia*, to be pruned in spring; *Baccharis patagonica* and *B. paniculata*; most varieties of *Ilex* require to be pruned in July; many of the newer forms of *Viburnum* (while *V. Tinus* answers well when severely cut into the old wood); *Calycanthus floridus*, *C. glaucus* and *Chimonanthus*.

fragrans should always be pruned immediately after flowering; *Hamamelis* which require very little pruning and that when necessary should be done after flowering; *Paeonia Moutan*, the chief pruning they require is to prevent the stocks on which they are generally grafted getting the best of the variety; *Abelias*, *Myrica Gale* (in early spring); *Exochorda* (direct after flowering); *Diervilla* or *Weigela* (as soon as flowering is over); *Andromeda japonica* *genista*; *Clerodendron tricholomum*; *Coronilla Emerus*; *Lonicera pophae rhamnoides*; *Hydrangea*; *Rhodotyphus kerrioides*; *Potentilla Rhamnus*; *Spiraea discolor*, *S. arguta*, *S. bracteata*, *S. media*, *S. Henry Thunbergii*, and *S. Wilsonii*; the various species of *Syringa*, which succeed better on their own roots than grafted on *S. vulgaris*; they should be pruned immediately after flowering; *Ericas*; *Azaleas*; *Rhododendrons*, *Junipers*

The following require light pruning while they are young, answer to the knife when adult and when they are old may be cut down to the ground. *Aucuba japonica* and its varieties, the different kinds of *Myrica*, etc.

Other plants that answer well to pruning, even if it be severe the various species of *Berberis*, some of which, *B. japonica* for instance, be cut down to the ground when on growing old they become unsightly; it is a mistake to graft the newer choice species from China on *B. vulgaris*; as the greatest possible care is needed to prevent the stock outgrowing the variety; the arborescent forms of *Hedera Helix*; *Ulex europaea*, *Lupinus*; *Hypericum* spp. which usually require only light pruning; *Lonicera delphus*; *Ceanothus*; *Stephanandra Tanakae* and *S. flexuosa*; *Thuja*, *Giantia*; *Taxus baccata*, etc.

The following require severe pruning: *Bupleurum fruticosum* (every year in March) the bushy *Loniceras*, which must be pruned after flowering; most of the species of *Ligustrum*; *Buddleia* (second week in April); *Ceanothus*; *Mastracanthus*; *Leycesteria formosa*; *Amorpha canescens*, *A. fruticosa*; *Forsythia* (after flowering); the various species of *Cornus*, especially *C. alba*, which should be cut down to the ground every year in the first week of April; *Sambucus*; *Spiraea japonica*, *S. Douglasii*, *S. hypericifolia*, *S. ciliolata*, *S. chamaedrifolia* (during the winter months), *S. arborea*, *S. Linnaea*, *S. sorbifolia* and *S. Aitchsoni* (require pretty severe pruning at the last week of March); *Rhus* (never before the first week of April); *Sorbus* (in the first week of March); *Symphoricarpos racemosus* (which has to be cut down to the ground every year); *S. orbiculatus* about every seven years; *Tamarix*, which should be cut to within two or three inches of the base of the previous year's growth; the majority of the climbers, such as *Lonicera Polygonum*, *Vitis* and *Wistaria*.

1012 - Vine Growing and Wine Making in Rumania. — PIROSCU, ELIA, in *Revue de l'Économie Agricole*, Vol. XX, No 116, pp. 73-88. Bucarest, July 1914.

Rumania is on the northern limit for the cultivation of the vine. The vine is more affected by cold damp summers than by severe winter. The dry warm summers of Rumania enable this crop to be grown successfully in spite of the rigorous winter.

The best lands for vine growing in this country are those situated at altitude of 150 to 400 m. (500 to 1300 ft.). The nature of the soil enables to be planted in all districts within the above altitudes with the exception perhaps of the extreme northern districts of Botoshani and Iasi.

The area of land under vines in 1882 was 287 075 acres, but owing to ravages of phylloxera it had decreased to 222 467 acres in 1913. The substitution of the destroyed vineyards with American stocks was begun in 1893. This work progresses slowly but surely, the area under American stocks having increased from 338 acres in 1893 to 25 403 acres in 1913. According to the statistics of the Ministry of Lands, the distribution of vineyards in 1913 was as follows:

		acres
In bearing	Native	112 195
	American	67 173
Substituted but not yet in bearing	Native	13 062
	American	30 037
Total		222 467

Although the area occupied by vines only represents 0.69 per cent. of the total area of the country, the vine is of the greatest economic importance to Rumania, for with an average yield of 175 gallons per acre and an average price of 1s 4d per gallon, the gross returns are about £. 12 per acre, apart from the value of the residues.

The statistics of the number of vine-growers, grouped according to area of their vineyards, show that 95 per cent. of them do not possess more than 1 hectare (2 1/2 acres) of vines. The largest extents of vineyards are found in the following districts:

	acres
Putna	34 601
R. Sarat	21 155
Prahova	13 747
Valcea	13 720
Buzeu	12 894
Dolj	10 787
Tecuci	10 218

On the point of view of quality, the vineyards of Cotnari give wines very much appreciated, but this region is to-day entirely ruined by phylloxera and in course of replanting.

On account of the rigorous climate the vines are covered with soil in the winter, after the pruning, except when this is postponed till the spring owing to cold weather setting in early; in this case the vines are tipped before burial. They are unearthed during the last weeks of March and begin to shoot early in April in the south, a fortnight later in the north.

The varieties planted are either old native sorts grafted on American stocks or foreign vines. The choice of varieties has not always been made

prudently or competently. The most important native varieties are as follows:

White: Grasa (Cotnari region), Feteasca Galbena (Odobeshti), Cioposhia (Dragashani), Gardanul (Dragashani), Gordinul (Dealul M. Red): Babeasca (Nicoreshti), Brghina (Dragashani), Roshu Vi and Roshu Moale (throughout the country).

The most common foreign varieties are:

French: Cabernet, Malbec, Sauvignon, Cinsaut, Clairette, P. Aligoté, Gamay, Aramon, Carignan, Muscat, Alicante, Bouschet, Lombaud.

German: Riesling.

Austro-Hungarian: Sylvaner, Veltliner, Kadárka.

Wine making is still in a primitive state, owing to the number of growers who cannot afford the expense of modern apparatus. In Rumania produced, from the 179 368 acres of vines in bearing, 33 514 gallons of wine, valued at £2 188 250. According to the statistics the Ministry of Industry and Commerce, the movement of wines in 1911

		gallons	£
Imports	In bottle	14 831	4 547 18
	Otherwise	132 131	28 599 16
	Total	146 962	£33 147 14
Exports	In bottle	625	191 14
	Otherwise	3 620	197 16
	Total	4 245	£389 10

Experiments on the production of sparkling wines are very numerous at the present time, but the future of such wines is still doubtful.

1013 - **The Resin Pine of Tonking.** — CARRIÈRE (Inspector of Waters and For *Gouvernement général de l'Indochine, Bulletin économique de l'Indochine*, Year 17, pp. 329-335 + 3 figs. Hanoi-Haiphong, May-June 1914.

Pinus Massoniana, which yields more resin with a higher st of essence than *P. maritima*, abounds in Indo-China, especially in the of Quang-Yên. Pines also occur in Tran-Ninh, Lang-Bian, in the tains of Ha-Giang and in Cambodia, especially in the first two n but they are not the same species as those in Quang-Yên and i considered as allied to *P. montana*.

In order to realise the value of this natural wealth, the Forest l ment of Tonking has taken over the control of the cutting and ins the natives in the methods employed with *P. maritima* in the l At the present time some 70 000 pines are being cut in Quang-Y. this number may be increased by at least 5000 trees a year for : 20 years.

The natural regeneration of the *P. Massoniana* forests is ra vigorous, and the Forestry Department has undertaken the reafor of certain cleared areas. Under average conditions the per of trees obtained by sowing in pots is about 20. One tree will yiel

of resin, containing 17 to 22 per cent. of essence. The resin is valued out 75 6d per 100 lbs.

There are numerous unproductive areas in the delta region of Tonking which would yield good returns if planted with resin pines. *P. Massoni* (the variety with needles in pairs) flourishes in Yên-Thê and the province of Thai-Nguyên.

- **The Balsam Fir.** — ZON, R., in *U. S. Department of Agriculture, Bulletin* 55, p. 68 + 8 figs. + 2 tables. Washington, D. C., 1914.

This monograph on the Balsam fir (*Abies balsamea* Mill.) deals with its distribution, the forest types in which it occurs, its yield of timber, its economic importance specially from the point of view of the pulp industry, its methods and cost of working, biology, characters of the timber, rate of growth and proposed methods of cultivation.

The total volume of timber in the zone of commercial exploitation is estimated at about 5 billions of board feet, or sufficient to last 30 years at the present rate of consumption.

With the present methods of cutting, the balsam fir gradually predominates over the American red fir (*Picea rubens* Sargent) in mixed plantations (1).

The growth of the balsam fir is more rapid than that of the red fir, but its life cycle is shorter and it reaches maturity earlier. It should be cut every 10 to 125 years, whilst the red fir under natural forest conditions requires 175 to 200 years. The annual growth of the balsam fir varies from 42 cubic ft. per acre.

The cultivation in small groups is recommended as the best method of management for this fir, and ensures a better proportion of the red fir in the natural regeneration of the forest.

The chief objections to the utilization of the balsam fir in the production of pulp are as follows: 1) the resin present in the wood; 2) the brittleness and weakness of the fibre; 3) the inferior yield of cellulose. The first drawback depends more on the manner of treating the wood than on its contents, the balsam fir being one of the rare conifers with complete absence of resin canals.

- **The Manchurian Timber Industry.** — BISHOP, C. M., in *Daily Consular and Trade Reports*, Year 17, No. 173, pp. 504-506. Washington, July 25, 1914.

The principal forests of North Manchuria are located in the upper reaches of the Sungari, Tumen, Yalu and Ussuri Rivers and the beginning of the Long White Mountain ranges.

Chinese official statistics are so far available for only one of the "Three Border Provinces", i. e. Kirin. In this province alone it is estimated that 9000 trees were cut in 3 years (1910-1912), this figure including pine,

(1) The distribution of the Balsam fir extends from Newfoundland to Great Bear Lake in the West and southwards to the uplands of Virginia; the distribution of the red fir is analogous but less determined (Cf. RATINGER, K. K.: *Die Nutzhölzer der Vereinigten Staaten*. I. Teil: Die Nadelhölzer, *passim*. Wiesbaden, 1910). (Ed.).

cypress, walnut, chestnut, willow and oak. Chinese statistics give an area of 2 111 square miles of timberland in Kirin Province.

There are two varieties of oak cut in Manchuria, — Mongolian (*Quercus mongolica*) and Chinese oak (*Quercus castaneifolia* or *sinesis*). Mongolian oak is met with all over the regions drained by the Amur, Gari and Ussuri Rivers, and everywhere in South Manchuria, where it reaches a height of 70 feet and a diameter of 2 to 4 feet. The Chinese oak occurs only in North Manchuria and is smaller than the Mongolian oak with leaves resembling those of the chestnut.

The granting of timber concessions in North Manchuria is governed by the "Regulations of 20 rules, governing the granting of concessionary national forests in the three Eastern Provinces (Manchuria)", enforced by order No. 21, of the first year of the Republic of China (1912), issued by the Department of Agriculture and Forestry. Concessions are granted only to those possessing citizenship in the Republic; and when a concessionaire desires to transfer or mortgage his certificate to another person, he must first obtain the sanction of the Bureau of Forestry.

Lumber taxes are of two classes: a) Royalty of national forests at the rate of 8 % according to market value, to be used in defraying the expenses in the administration of national forests, and b) Government tax at the rate of 10 % of the market value, and collected by the Department of Finance for the administrative expenses of the Government; c) a local tax may be imposed depending on the size and quality of the timber.

The Russian timber concessionaries, who formerly supplied only the needs of the Chinese Eastern Railway, have begun to receive orders from Europe and England for timber. There were exported to European ports in 1913 via Vladivostok 200 000 cubic feet in round and square logs and beams. It is probable that in the future this timber will be shipped in increasing quantities from Nikolaievsk; but it is doubtful if this export of timber will continue, for as soon as the present plans for the construction of new railways in Manchuria are put into operation, there will be a greatly increased local demand for timber. Also there is an increased demand for Manchurian timber in China and the Far East generally, since it is much more highly than Japanese or Korean timber.

According to Chinese customs statistics, about 9 000 000 cubic feet of timber material were exported to Vladivostok and over 3 000 000 in 1909. An increase in the duty reduced the export to 15 000 cubic feet in material and 147 000 in pieces in 1911. Further, a considerable amount of timber in the form of firewood, sleepers, round log ends, and boards are required in the construction of the Chinese Eastern Railway.

LIVE STOCK AND BREEDING.

1016 — *Eleusine indica* (Crowfoot Grass) in Queensland, Dangerous to Stock. SMITH, FRANK, and WHITE, C. T., in *Queensland Agricultural Journal*, Vol. II. 1, pp. 158-160 + 1 fig. Brisbane, August 1914.

Eleusine indica had already been reported as a plant dangerous to stock in New South Wales. The writers have observed its occurrence

Queensland, where it grows throughout the State, though mostly in coastal districts. They ascertained the presence in it of compounds containing cyanogenic acid. The freshly cut grass (in June of the present year) treated by maceration with water and distillation 0.92 grain of hydrocyanic acid per pound. The quantity would probably have been still larger if the plant had been cut when in vigorous growth, that is during the summer months. Cases of sickness in horses and sudden mortality of sheep in Queensland runs infested with *Eleusine* are attributable to this.

1. - The Sheep Maggot Fly (*Calliphora rufifacies*) and its Parasite. — PROGGATT, WALTER W. (Government Entomologist), in *The Agricultural Gazette of New South Wales*, Vol. XXV, Part 2, pp. 107-111 + 1 plate. Sydney, February 1914. In the first records of flies that deposit their eggs on sheep in Australia, the Sheep Maggot Fly was not included among those that bred in the soiled wool of living sheep. Nor was it included among sheep flies in a paper the author published in 1905. In 1910 he had not yet bred it from the maggots found in soiled wool of New South Wales, though in the West. It was very plentiful about killing yards, freshly skinned sheep and dead lambs.

After 1910 it was soon found that the so-called "hairy maggots" were the larvae of this fly and that it also bred in soiled wool. But at that date *Calliphora rufifacies* was not as common as *C. oceaniae* and *C. vicina*, which till then had been the most injurious. This is another case of the adoption of new habits by a previously harmless insect on account of new conditions arising through the presence of strong smelling wool. From the writer's investigations in the northern and western districts of New South Wales and Western Queensland it is evident that this is now the common sheep fly, while the other two species, from which it probably has acquired the habit, have almost disappeared from this great area and cause comparatively very little damage.

Lucilia sericata, the sheep maggot fly of Great Britain, lays its eggs on meat and has been a pest chiefly in Ireland and Scotland from an early date. It is a common meat blowing pest about Sydney and suburbs, but in earlier investigations it had never been noted in the West or South-West, though now well established, and it has been bred from soiled wool. Hitherto it had never been recorded from the wool or wounds on sheep.

In September 1913 the Minister of Agriculture of New South Wales instituted an Experiment Station for the study of Sheep Maggot Flies at Yarrawin, district of Brewarrina, where sheep maggot flies have been a very serious pest for some years. This Station has discovered that an indigenous chalcid parasitizes very actively the larvae of *Calliphora rufifacies*, as well as those of *C. villosa* and *C. oceaniae*, and that it multiplies very rapidly when bred under artificial conditions. It takes about eleven days to develop from the egg to the perfect insect, which is a small wasp about one-twelfth of an inch in length.

1018 - **Typhus in Young Pigs in Germany.** — PFELLER and HURLER, in *Mitteilungen des Kaiser Wilhelms Instituts für Landwirtschaft in Bromberg*. Vol. 6, Part 4, pp. 261-264. Berlin, March 1914.

This paper contains many bacteriological, pathological and anatomical data on the typhus of young pigs and on its diffusion in the German Empire.

So far as it has been studied by the writers in many localities, it is easy to recognize by anatomical examination.

The disease is undoubtedly very widely spread and it has been found by the writers once or more in the provinces of Brandenburg, Hanover, East Prussia, West Prussia, Pomerania, Posen, the Grandduchy of Mecklenburg and in Alsace and Lorraine. Altogether in the course of two years the dangerous disease was observed by them in upwards of a hundred young pigs in twenty-two herds. The writers are convinced that if other countries also were to pay more attention than they have hitherto given to this disease it would be found to be no less frequent abroad than in Germany.

From the point of view of its epidemic character the disease should be considered as important as swine fever. Economically also, owing to the great mortality which it causes, it should command the greatest attention. Of the cases observed by the writers 78 per cent were fatal. According to the information given by the owners in whose herds the disease was rife, it caused a loss of from 25 to 50 per cent. According to other informants the mortality was valued at 60 per cent. Anyhow, where the disease appears pig breeding and its profits are seriously endangered.

In order to check the spread of the disease, veterinary police regulations would be useful; practically it can be successfully controlled by vaccination of all young pigs.

1019 - **Control of Cattle Ticks and of the Diseases Spread by them (1).** — BRÜNNOW, and SMITH, F. Factors Influencing Efficacy and Deterioration of Cattle-dipping Fluids, in *Queensland Agricultural Journal*, Vol. II, Part I, pp. 81-92. Brisbane, July 1914. — II. THEILER, A., Arsenic Dips and their Use in the Control of Ticks and of the Diseases Spread by them in South Africa, in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 16, Part 1, pp. 1-26. Berlin, September 12, 1914.

I. — A series of experiments was undertaken to investigate the most effective action in the extermination of cattle ticks by means of dipping fluids. Steers were sprayed with an arsenic dipping fluid (Queensland Government formula) to avoid accidental swallowing. Blood drawn before and after the spraying showed that the effect of the dip on the animal was to increase the arsenic content of the blood during the twenty-four hours immediately following the application of the dip. Two infected heifers were treated, on small areas of the skin, as follows.

A) Ticks were painted carefully with dipping fluid without wetting the skin of the host.

(1) See also: B. 1911, Nos. 2198, 2425, 2753; B. 1912, Nos. 146, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

- B) The skin of the host was wetted without wetting the ticks.
- C) Small quantities of the dip (5 cc.) were injected subcutaneously.
- D) Larger areas of skin with ticks were thoroughly wetted with dipping fluid.

Only D proved an effective method of destroying ticks, though some of the ticks in trials A and C appeared to sicken. These experiments, together with the fact that the ticks on small areas which escape wetting in ordinary dipping operations (such as the head) do not die, led the writers to conclude that when an arsenic dip of minimum concentration is used, the death of the ticks within a few days is due to the combined effect of absorption of the poison through the skin of the tick after dipping, and absorption of the poison by the skin of the animal from which it is subsequently sucked by the tick.

The efficacy of any dipping fluid depends largely on its power of thoroughly wetting the skin of host and tick, leaving a uniform thin film of fluid, i. e. on its degree of emulsification. In order to determine the emulsifying power of certain agents, a series of experiments was carried out in which the surface tension of solutions of different recognised or proposed emulsifiants was determined by observing the number of drops formed when a measured quantity of liquid was allowed to run through a standard opening. The result showed the superiority of oleic over the stearic acid soaps, while Stockholm tar also proved very satisfactory; the good qualities of the latter product and of the oleic acid soaps were not diminished by use with acid arsenite as recommended in the Government formula. Further, Stockholm tar did not lose its emulsifying power to the same extent as other emulsifying agents when the dip was made up with hard water, and for that reason should be a valuable ingredient in dipping fluids.

The conversion of arsenite to arsenate on keeping was also investigated. This process had occurred in about 25 per cent. of the dips examined during the three previous years; it decreases the value of the dip, as the killing property of the arsenate is only about half that of the arsenite. A series of tests was made, in which a) pure arsenite solution, and b) an arsenite solution containing tar and soap and approximating to the Government formula, received a small amount of nutritive material, were sterilised, inoculated with oxidised dipping fluid and incubated under various conditions of illumination. The results were as follows:

1. Pure arsenite solutions under sterile conditions remained unoxidised in darkness or in diffused light, but underwent marked oxidation in direct sunlight.
2. In the presence of tar, sterile arsenite solutions underwent marked oxidation in darkness; in diffused light and direct sunlight the oxidation was still more marked.
3. The oxidation of arsenious to arsenic acid was also effected by bacterial agency; the oxidising bacteria seemed to be equally active both in light and in darkness, but there appeared to be a marked difference in the activity of different strains of organisms.

4. Tar, apart from its effect in itself inducing oxidation, appears to exert an inhibitive effect on the activity of oxidising bacteria, and this inhibitive effect seemed to be exerted to a greater extent in sunlight than in direct sunlight in tar solution almost completely preventing the activity of certain strains of bacteria.

5. Bactericides, such as mercuric cyanide and formalin, were effective in preventing growth of oxidising organisms, and bacterial activity was necessarily not evident except in presence of nutritive material.

In the 75 per cent. of cases in which oxidation does not occur in dipping fluids, it has been suggested that the apparent inhibition is due to the agency of organisms capable of reducing arsenic to arsenious acid. In order to test this point, sterile arsenate solutions, with and without soap, provided with nutritive material and equivalent to 0.2 per cent. As_2O_5 , were inoculated with various media likely to gain access to dipping fluids in dipping practice (dung, soil, grass, etc.); they were maintained under conditions of light and complete darkness during periods of two and four weeks, when they were examined for arsenic in the reduced form of arsenous acid. Reduction was found to have taken place in all cases where tar and soap were present, but only in a few cases where tar and soap were absent; would thus appear that the tar has a less well marked inhibitive effect on reducing than on oxidising bacteria and that the former only gain the upper hand when the latter have been weakened. The maintenance of the arsenite concentration of dipping fluids would therefore seem to be mainly on the growth and activity of organisms capable of preserving in opposition to the oxidising influence of tar, light and the oxidising bacteria; the determination of the environmental conditions most conducive to their multiplication presents the most promising field for further investigation.

For the present the recommendations for cleaning out dips, when dipping-fluids show persistent rapid oxidation, are to empty and clean thoroughly, spray walls, woodwork and dripping yards with formalin solution, whitewash dip and timber, and allow at least a week's interval before recharging.

II. — In South Africa the most dangerous cattle disease of recent years is the East Coast fever caused by a blood parasite, *Theileria parva*, which was introduced in 1902 from German East Africa. This parasite develops in the lymphatic organs, whence, on attaining maturity, it passes into the blood corpuscles. According to the writer the disease is spread by ticks, especially by the brown tick (*Rhipicephalus appendiculatus*) which has two hosts, and the red tick (*R. evertsi*) with two hosts; but the black tick (*R. Simus*) and the blue tick (*Boophilus decoloratus*) may also be considered as carriers of the disease. The writer gives a short description of the history of each of these ticks.

For the prevention and cure of the disease, the first thing is the destruction of the ticks, but it took a considerable time for this desideratum to be adopted in practice. An impulse in this direction was given by the steady spread of the Coast fever in Natal, where the measures successful

ated in the Transvaal were of no avail. At first it was tried to dip the male once every four weeks in an arsenical fluid, but as no effect was obtained, the interval between the successive dips was shortened to three, and one week, without however obtaining any better results. Wherein PRICEFORD experimented in Natal with dips repeated every five and every three days and found that with three-day intervals the disease could be stopped. The efficacy of the latter method lies in the fact that action in cattle sets in between 60 and 120 hours after the ticks have been on to their hosts.

The composition of the dip originally recommended by PRICEFORD is 1 1/2 lbs. sodium arsenite, 5 1/2 lbs. soft soap, 2 gallons petroleum and 400 gals. water. It was later discovered that the dip was more efficient without petroleum or soap.

For dips repeated at short intervals, farmers in South Africa use commonly 4 to 4 1/2 lbs. of the arsenic salt to 400 gallons of water. When the animals are dipped at longer intervals the proportion of arsenic is correspondingly increased.

On the occurrence of an outbreak of the disease dipping must be continued until the ticks living in the grass have been starved to death this requires as much as 14 months. As a general rule all the animals that are grazing must be dipped, including pregnant cows and calves. Horses, sheep and pigs are not so frequently dipped as cattle. The average time allowed for each animal does not exceed 6 seconds.

As secondary effects of these dips, a temporary diminution of the milk yield of the cows and of the capacity for work of the oxen are generally noted in South Africa, but no cases of poisoning through drinking the arsenical liquid while dipping have been observed.

The ticks begin to diminish after the first dip; the first to die are those that are not fully gorged, the last the fully gorged ones. The parts of the animal that are first freed from the ticks are the udder, the insides of the legs and the barrel. The most easily destroyed ticks are the one-host ticks, the most difficult to eradicate are the two-host red ones. Besides Coast fever, all the other diseases which are spread by ticks in South Africa, such as Texas fever, anaplasmosis and the like, are controlled by arsenic dips are practised. Besides which, in many localities, the fatality among calves has been considerably reduced. The disappearance of white scour in calves and of a contagious inflammation of the eyes in calves caused by *Filaria lacrymalis* wherever arsenic dips have been used, has been remarkable.

The only drawback that can be mentioned in connection with these dips is that the young animals can no longer be immunized against Texas fever and anaplasmosis.

The writer concludes with the observation that the use of arsenic dips in South Africa has solved at one stroke the problem of the prevention and control of all diseases transmitted by ticks.

1020 - **The Effect on the Milk Glands of Volatile Fatty Acids from the**
 — BEGER, C. in *Die landwirtschaftlichen Versuchs-Stationen*, Vol. 85, Part 1-2, pp.
 163. Berlin, August 3, 1914.

The writer gave alternately to two goats, together with a certain basal ration, first an oil having a very high Reichert-Meissl value (guinea pig cheek oil) and then one with a very low R. M. value (earthnut) and observed to what extent the addition of volatile fatty acids to the food acted upon the R. M. value of the butterfat and generally upon lactation.

The two animals experimented upon were of the same breed and in an advanced period of lactation. The experiments showed that the addition of volatile fatty acids to the fodder had no sensible effect upon the R. M. value of the butterfat, but that it had a stimulating effect upon the absolute quantity of milk and upon its composition.

Though the guinea-pig cheek oil is a fat which owing to its specific characters (it consists chiefly of valeric acid) does not pass directly into the milk glands and thence into the milk fat, it must contain other substances similar to the components of milk which act favourably on the nutritive value of the milk glands. It can consequently be assumed that in the fat contained in food there are substances which can act as stimulants upon the milk glands independently of their nutritive value.

According to the writer the composition of the milk fat seems to be influenced only by such components of the fat in the food as already exist in the milk. The milk glands have the power of rejecting those substances which do not already exist in the milk or of utilizing them only under quite special conditions. In consequence of this fact the writer does not think that experiments with iodized or coloured fats made with the object of determining the passage of fats contained in the food into the milk can give conclusive results. The udder decomposes the available material and then selects among these components. The loosely combined iodine and similar substances are probably first separated, after which the fat as if they had not been joined to the fat.

1021 - **The Presence of Arsenic and Manganese in some Feeding Stuffs.** — JABON and ASTRUC, A., in *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 159, No. 3, pp. 268-270. Paris, July 20, 1914.

The presence of minute quantities of arsenic and manganese in animal tissues has previously been recorded. The same fact has now been proved in the case of vegetable tissues. In order to show the source of supply of the arsenic and manganese in animals, the writers have determined the presence and percentage in the more common feeding stuffs. The results are shown in the accompanying table.

Forage.	Composition		Manganese		Arsenic
	Water	Ash	Mgms. per 100 gms. of dry matter	Mgms. per 100 gms. of ash	Mgms. per 100 gms. of dry matter
<i>Alfalfa sativa</i>	64.00	3.35	5.00	53.73	0.050
<i>Hyoscyamus humilis</i>	73.50	2.00	4.33	57.50	0.056
<i>Alfalfa sativa</i>	62.90	4.75	2.68	21.05	0.054
<i>Alfalfa pratensis</i>	67.50	3.55	5.38	49.29	0.037
<i>Alfalfa tuberosum</i>	74.46	0.85	0.14	4.23	0.031
<i>Alfalfa vulgaris</i>	91.83	1.16	1.63	11.43	0.061
<i>Alfalfa nigra</i>	64.20	2.48	17.46	322.58	0.019
<i>Alfalfa vulgaris</i>	55.45	1.00	1.56	140.00	0.011
<i>Alfalfa sativa</i>	13.66	1.11	0.93	72.00	0.008
Alfalfa (seed)	17.65	1.52	1.94	105.26	0.036
Alfalfa (stems and leaves)	85.50	1.45	4.13	41.37	0.027
<i>Alfalfa distichum</i>	10.06	2.60	3.78	130.76	0.055
<i>Alfalfa sativa</i>	19.66	2.99	4.97	133.77	0.062
<i>Alfalfa</i>	17.20	4.74	8.59	150.21	0.012
<i>Alfalfa</i> (1)	52.75	6.80	16.03	117.64	0.053

(1) Consisting of 96-98 per cent. Gramineae, the species present being: *Anthoxanthum odoratum*, *Trifolium pratense*, *Alopecurus pratensis*, *Lolium perenne*, *Ranunculus acris*, *Cerastium brachypetalum*, *Linum angustifolium*, *Trifolium minus*.

2. The Bacterial Flora of Some Fresh or Fermenting Concentrated Foods and its Effect on Milk. — WIGGERS, A., in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 41, No. 1-3, pp. 1-227. Jena, May 27, 1914.

The three concentrated foods most frequently used in Switzerland, namely bran, earthenut meal or cake, and sesame meal or cake, were examined. The fodder containing the highest number of germs was bran, which, as an average of 15 samples, contained 6 million germs per gram. Earthenut meal and cake contained, as an average of 18 samples, 1 1/4 million germs per gram. Sesame meal and cake, average of 24 samples, contained about 1 million per gram.

Pollards were by 57.5 per cent. richer in germs than bran. Earthenut cake contained more of them than the meal, while, with sesame cake, the difference in this respect was found to exist between the cake and the meal. The variation in the germ content of the individual fresh samples was relatively greatest in bran and smallest in sesame.

The bacteria in the fresh sesame and earthenut foods are much the same as in bran, and much richer in species than in bran. The latter contained 21 different species of schizomycetes, earthenut concentrates 44, and sesame 54. As typical species in bran the writer found: *Bact. coli*, var. *luteolus*, *Lehmann* and *Levy*, yellow acid producers *Levy* (1), *Bact. herbi-*

(1) Not yet named in Latin.

(Ed.).

cola aureum Burri and Duggeli, and *B. fluorescens liquefaciens* Lehman and Neumann. The earthnut foods contained in prevalence *Bact. mesentericum vulgatus* Flüge, *B. subtilis* Cohen, *B. coli* var. *luteoliquefaciens* and L., yellow acid producer Levy, and gas-forming lactic acid bacteria. As typical sesame bacteria the following were found: *Bact. mesentericum vulgatus* Flüge, *B. subtilis* Colon, *B. coli* var. *luteoliquefaciens* L. and yellow acid producers, gas producers and cocci.

In moistened concentrates the number of germs increases to an extraordinary degree and at 37° C. after 24 hours reaches its maximum, after which it sinks. During this time there is such a constant change in the nature of the flora that the fermentation may be considered as a metabolic process. The changes thus brought about are, during the first days, principally a lactic acid fermentation; later more mixed fermentations prevail. The former was more clearly visible in the earthnut food and less so in the sesame. Fluorescent bacteria are fairly common in both.

The typical bacterium of putrefaction, *Bact. putrificus coli*, especially abundant in earthnut meal and cake (in 55 per cent. of samples), in bran rarer. Through the multiplication of these bacteria, concentrated food can undergo such changes that animals refuse to eat it, or if it is eaten it produces symptoms of poisoning, as the writer proves by examples. He has found in bran also the virulent bacillus of anthrax, but he was able to demonstrate experimentally on animals. Thus the sudden unexpected breaking out of anthrax may be explained in many cases.

As for the influence of these feeds, fresh or fermented, on the bacterial contents of milk, the writer says that small contaminations with them at normal temperatures have no noticeable effect upon the fermentation of milk, but at higher temperatures, 37° C. (98.6° F.), changes in the milk and the evolution of gas are accelerated. In dirty milk or in ordinary somewhat older milk, small additions of these concentrates do not cause noticeable differences in the bacterial content, while in sterilized milk changes brought about by such additions are somewhat more marked.

1023 - The Food Value of the Jack Bean (*Canavalia ensiformis*) (1)
BARNSTEIN, F., in *Die landwirtschaftlichen Versuchsanstalten*, Vol. 85, Part 1-2, pp. 113
Berlin, August 3, 1914.

The Jack bean (*Canavalia ensiformis*) is a leguminous plant cultivated in German East Africa and in many other tropical countries and distinguished by its abundant yield and great resistance. On account of its abundant yield attempts have been made in German East Africa to utilize the seeds in the country itself and also to export them.

Notwithstanding that a certain quantity of these beans are exported to Hamburg, their sale abroad has not hitherto amounted to much.

The chief obstacles to their utilization in the German East African protectorate are that the natives, not knowing the plant, are not inclined to eat the seeds, and that it is not yet well known whether the beans are poisonous, as is believed in many localities, or not. If they are not

(Ed.)

(1) See also No. 498, B. May 1913.

harmless, they may be of considerable importance as a feedingstuff, they are very rich in nutritive material. Chemical analyses of Jack beans were carried out by BONAME in 1911, they give the following composition for seeds and pods :

	Seeds percentage	Pods
Water	13	15.2
Protein	25.62	5
Fat	2.32	0.64
Crude fibre	7.9	57.91
N-free extract	47.94	15.47
Ash	3.22	5.78

According to a recent analysis by the writer the seed in its original condition contains :

Water	13.16 per cent.
Crude protein	31.51 "
Pure protein	24.82 "
Fat	2.18 "
N-free extract	41.99 "
Crude fibre	8.59 "
Ash	2.47 "

The digestibility of the beans as it resulted from a four-weeks test led out by the writer on two young sheep was as follows :

Dry matter	87.5 per cent.
Organic matter	88.6 "
Crude protein	80.5 "
Crude fat	72.1 "
N-free extract	99.1 "
Crude fibre	72.9 "

With these coefficients of digestibility, the starch value works out at per cent., with 18.69 digestible pure protein. The jack bean stands as regards its nutritive value, somewhat lower than the common field, which according to Kellner has a starch value of 66.6 per cent. and per cent. digestible pure protein.

During the experiment the animals were given the relatively high ration of 0.44 lb. of crushed beans, without apparently suffering any ill effects. It would be premature to draw the conclusion that these beans, in all conditions, are a harmless fodder and it would be advisable to test at the experiments.

- Has the Dry Matter in the Various Root Crops the Same Food Value? —
HASSBERG, NILS, in *Mitteilungen der Zentralanstalt für das landwirtschaftliche Versuchs-
wesen in Schweden*, pp. 11-12. Stockholm, 1914.

During the winter half-years 1908-09 and 1909-10 exhaustive feeding experiments were carried out with the object of determining whether the usual assumption that the dry matter in the various root crops has the same value is correct or not. Thirty milch-cows were used, and divi-

ded into five equal groups. In the preparatory period they were all 66 lbs. of Bortfeld turnips per diem. During the time that the experiment proper lasted, about $1\frac{1}{2}$ months, one group continued to be fed the usual turnips, and the other groups were given other roots containing the same amount of dry matter. The rations of the various groups head and per day were as follows :

Group I	66	lbs. Bortfeld turnips
" II	36.70	" Sarunner "
" III	33.66	" Hellrothe Flasche mangolds
" IV	40.04	" Swedes
" V	41.80	" Eckendorf mangolds

Owing to the different content of dry matter, the quantity of root varied, the dry matter in all cases being 5.28 lbs. per head per day.

The experiment showed that the substitution of one root for another did not cause any appreciable difference in the milk yield nor in its fat content. The live weight of the cows was also not affected. The conclusion can thus be drawn that the dry matter in the various roots has practically the same food value.

1025 - **Common Salt as a Poison for Stock.** — GUTHRIE, F. R., in *The Agric. Gazette of New South Wales*, Vol. XXV, Part 8, pp. 663-664. Sydney, August 3.

Although a certain amount of salt is a necessary adjunct to the diet of animals, an excessive quantity is injurious.

In the case of pigs and sheep, 4 to 8 ounces is said to have produced poisoning (see LANDER, *Veterinary Toxicology*, 1912). In larger quantities it has proved fatal to horses and even to cattle. Fowls would appear to be particularly susceptible. According to experiments conducted by LUFFRAN, 4 grams per kilo live weight are fatal if injected in solution into the crop. Recently several instances have been brought under the notice of the Department of Agriculture of New South Wales, in which deaths of poultry and pigs have been traced to an excessive amount of salt in the food. In a fowl which had died suddenly, the contents of the crop weighed 50 gms. and were found to contain 2.42 gms. of salt, 4.84 per cent.

The Department therefore warns farmers of the necessity of avoiding the use of certain foods found on the market. One sample of pollard was discovered to contain no less than 32.2 per cent. by weight of common salt. Other samples contained varying amounts down to 5.8 per cent. One case of poisoning of pigs was reported, and it was found that the food supplied to them was a mixture of pollard, barley meal and 10 per cent. of salt.

The toxic effect of salt appears to be due to its action on the nervous system, so that the animal becomes unable to walk and, finally, to stand. It is caused by asphyxia, due to loss of power in the respiratory muscles.

Scale of Points for Judging a mixed Dairy Farm. — *The Agricultural Gazette New South Wales*, Vol. XXV, Part 2, p. 106. Sydney, February 1914.

1. Agricultural Association wrote to the Department of Agriculture
; South Wales asking for a scale of points suitable for a competition
is including dairying. Two experts of the Department compiled the
ng classification :

STOC
ORG
FN

		Points
A. Management :		
Checking production and quality of dairy produce and the work- ing of dairy machinery	25	
Supervising, feeding and watering of stock ; making provision of fodder and pastures (calf feeding methods to have special at- tention)	30	
Attention to breeding with a view to improving yields and supply of heifers for the future ; supervising with a view to disease prevention in calves, cows, etc.	35	
Book-keeping and milk record keeping ; stud books for cattle and pigs	10	
	100	
B. Stock :		
1. Cattle, quality and type, taking into consideration the character of land and purposes for which cattle are used, viz. cheese, butter or town milk supply. Milk and butter yields to be taken into account	100	
2. Pigs	30	
3. Horses	15	
4. Poultry	5	
	150	
C. Crops, including rotation, cultivation methods and manuring :		
1. Most suitable fodder crops for dairy cattle	15	
2. Other crops	15	
3. Yield	15	
4. System of cultivation, including manuring methods, rotation and cleanliness of crop	15	
5. Freedom from disease in crop	8	
6. Truthness to type	7	
	75	
D. Pastures :		
Improvement of pastures ; most suitable grasses, sown accord- ing to locality ; grass experiment plots	50	
Subdivision into most suitable paddocks	25	
	75	
E. Buildings and Fences :		
Dairy and bails	18	
Homestead	12	
Piggery and poultry farm	10	
Fences and gates	10	
	50	
F. Machinery and Tools	50	
Grand Total	500 points	

1027 - Some Data on the Animal Products and, the Control of Rabbits in South Wales, 1913. — JACKSON, H. V., in *The Agricultural Gazette of New Wales*, Vol. XXV, Part 6, pp. 504-506. Sydney, June 1914.

During the year ending 31st December 1913 the value of the animal products exported from New South Wales was as follows:

	£
Wool	11 699 858
Meats: Beef	247 934
Mutton and Lamb	1 215 878
Rabbits and Hares	373 633
Preserved	575 855
Tallow	1 002 076
Skins: Hides	910 609
Sheep	439 525
Rabbit and Hare	310 694
Other	612 812
Leather	369 210
Butter	988 143
Live animals	54 098

The number of rabbits exported was 13 556 160 head; the hares, 22

The number of poultry on farms of 1 acre and upwards, at the end of 1912, was 3 351 000 fowls, 261 100 ducks, 23 900 geese, 216 300 turkeys, 6000 other birds. The estimated number of eggs obtained during the year was 13 769 000 dozen. During the season 1913-14, 476 312 dozen eggs were held in cool stores. In addition there were also stored 9 802 tin-pulped eggs of 40 dozen each.

1028 - Comparison between the Observed and Calculated Production of Ruminant Cattle. — PRENTISS, ARMSBY HENRY, in *Landwirtschaftliche Jahrbücher*, N. F., Part 5, pp. 753-759. Berlin July 14, 1914.

After a review of the experiments of RUBNER, LAULANIE, ATWATER, BENEDICT, and BENEDICT and MILNER, all of whom have shown the relations between chemical, thermic and mechanical energy are the same for man and in carnivora as everywhere in nature, the writer reports on his own experiments on herbivorous animals, which have been carried out as usual by measuring the production of heat by means of a respiration calorimeter (Atwater-Rosa system) and then comparing the results with the production of heat calculated from the balance of the nutritive elements. Altogether 57 experiments with oxen, nearly or quite mature, have been carried out since 1902, the results of which are available for comparison. They show, as was to be expected, that the results of the individual experiments do not always agree perfectly with the requirements of the law of the conservation of energy. The greatest deviations were + 7.6 per cent. and - 5.1 per cent. The average of the 57 experiments, however, shows that the observed production of heat differs from the calculated heat by 0.4 per cent. This difference is about the same as that found by the above-mentioned observers.

The conclusion is thus justified that in herbivorous animals the same laws between chemical, thermic and mechanical energy exist as in man and in nature generally.

Calf Rearing Experiments in Hungary. — KERÉKES, GÉZA, in *Köztudományi Közlemények*, No. 61, pp. 2172-2173. Budapest, August 15, 1914.

These experiments were carried out with 18 calves on the Vitka farm belonging to Count Károlyi. One batch of animals was fed on separated milk, the cream being replaced by rye flour: the writer was led to make this choice on the principle that carbohydrates can take the place of fats in animal nutrition. The flour was given at the rate of first 4 oz., later 5 oz. per gallon of separated milk, the formation of lumps being avoided by constant turning in a churn. The emulsion was then warmed to the temperature of the cow's udder.

The 18 calves were divided into two groups, one of which (Group I) was fed naturally, while the other (Group II) received the following treatment during four successive periods: 1) whole milk up to the age of 4 weeks; 2) gradual substitution of whole milk by the emulsion until the quantity consumed reached 5 oz. per gallon at the end of about 8 weeks; 3) milk emulsion with a gradual reduction in the quantity of flour toward the end of the period, viz. to about 3 months old; 4) separated milk at the rate of 2½ gallons per calf daily. The determination of the rations during the three earlier periods was based on the eighth part of the live-weight of the animals, which were weighed each week.

Table I gives the live-weight of the calves at birth and at 12 weeks. During the 4th period the artificially fed calves continued to drink their full allowance of separated milk, whilst all except three of the calves in the other group refused to take skimmed milk when taken off whole milk three months (see Table II).

TABLE I. *Weight of calves at birth and at 3 months (lbs).*

Group II			Group I		
No. of calves	Weight at birth	Weight at 3 months	Nos. of calves	Weight at birth	Weight at 3 months
55	73	317	115	70	211
60	75	251	88	75	233
61	77	258	116	77	249
26	79	348	7	82	229
144	79	293	86	86	266
77	84	326	85	88	260
19	86	266	118	88	269
14	86	306	59	88	
12	88	306	108	93	231
Average	80.6	297.5	Average	82.9	248.2

TABLE II. — *Weight of calves at 4 months (lbs.).*

Group I		Group II		Remarks
Noe. of calves	Weight	Noe. of calves	Weight	
55	401	115	253	refused milk
60	353	88	271	"
61	337	116	306	"
26	417	7	287	"
144	375	86	311	"
77	397	85	335	took milk
19	366	118	359	"
14	386	59	353	"
12	390	198	271	refused milk
Average	380.0	Average	305.0	

TABLE III. — *Average weekly rations per calf from the 1st to the 12th*

Period	Group I	Group II		
	whole milk — gals.	whole milk — gals.	separated milk — gals.	rye — lbs.
1st week Colostrum			
2	7.2	7.2	—	—
3	8.0	8.0	—	—
4	9.2	9.2	—	—
5	10.5	8.8	1.7	0.41
6	13.1	9.9	3.2	1.17
7	14.2	7.9	6.2	1.87
8	15.4	3.1	12.3	3.70
9	16.6	—	16.6	5.00
10	12.5	—	12.5	3.74
11	7.8	—	7.8	2.35
12	4.6	—	4.6	1.14
Totals . . .	119.2	54.2	65.0	19.41

Omitting the cost of hay and oatmeal, which was the same in groups, the cost of feeding works out as follows :

5 milk calves:

119 gals. at 1s 1½d per gal. £ 6 15s

5 milk calves:

54.2 gals. of whole milk at 1s 1½d	£ 3	1s	7d
65 " separated milk at 3.6d	19	8	
19.4 lbs of rye flour at 1.1d	1	9	
	£ 1	3s	0d

Thus the difference is £2 12s in favour of artificial feeding.
These figures show a considerable economy.

Indian Cattle in the Philippines. — EDWARDS, C. W., in *The Philippine Agricultural Review*, Vol. VII, No. 7, pp. 288-291 + 2 plates. Manila, July 1914.

The Philippine Archipelago, with its extensive pasture area, abundant supply and tropical climate, is principally a live-stock country; nevertheless there is a great deficiency of both meat and work stock. This state of things cannot well be remedied by the importation of animals from abroad, as these would be more liable than the native cattle to the diseases that have caused the depletion in numbers. On the other hand the lack of good local breeds is a serious obstacle to the improvement of the native stock. A considerable amount has been spent in an effort to raise pure-bred European and American cattle and their crosses with the native stock, but, except in a few cases, the attempt to raise pure-breds has failed, and the crosses, while showing good conformation and size, were more susceptible to disease. In fact this has been the general experience throughout the Tropics under natural range conditions. Considerable numbers of cattle have been introduced from tropical China and Indo-China, but they, and especially the former, are susceptible to rinderpest and are not generally as great an improvement as would be desirable, as they are lacking in the prepotency of their characters.

Of recent years Zebu from British India have been imported into the Philippines and successful results have been obtained in breeding both pure-breds and crosses.

Lieut. Col. W. D. Gunn, formerly superintendent of the civil veterinary department, Madras, distinguishes seven principal breeds of Zebu (*Bos indicus*) cattle:

1. Mysore breed or Amrat Mahal.
2. Mahadeswarabetta or Alumbadi.
3. Ongole or Nellore.
4. Kangayan.
5. Pulikolum, Jellicut.
6. Kapliyan.
7. Gumsur.

Of these breeds the most important are the Ongoles and Mysore; the former are particularly noted for their suitability for heavy draught and the latter for their extremely hard feet and aptitude for road work. The Ongole is bred in greatest numbers in the Guntur district, Madras presi-

dency. This breed has been imported into Brazil, Argentina, Java, Africa and a few into the United States, particularly into Texas. It is the only breed with which any definite breeding experiments have been carried on in the Philippines. It has been imported by local dealers by the Bureau of Agriculture, which experimented with these cattle at La Carlota station, Occidental Negros Province, at the Trinidad station farm, Benguet, in the subprovince of Bukidnon, and at Alabang.

The results have been excellent. These animals showed a high resistance or apparent nearly complete immunity to rinderpest, immunity to typhoid fever and a resistance to insect pests nearly equal to that of the native animals. In all sections excepting those at high altitudes where the temperature is comparatively low during the rainy season, these animals have exhibited remarkable qualities of thrift and hardiness, superior to those of the native stock; they have proved also successful for road and light draft work. Their crosses with the native stock are highly resistant to rinderpest, they are a great improvement in size and conformation over the native dams and exhibit to a great degree most of the desirable characters of the Zebu parents.

In many respects Indian cattle are not to be compared with improved European and American breeds, but they are far better adapted to existing conditions in the Philippines.

1031 - **Rearing Pigs in Movable Pens.** — HVENEGAARD, M., in *Gaceta Rural*, Vol. No. 85, pp. 37-45 + 9 figs. Buenos Aires, August 1914.

The writer has obtained very good results in the Argentine with the system of rearing pigs in movable pens; he has obtained an average of 12 pigs per sow per annum with a herd of 1000 sows.

The pen measures 9 ft. 9 in. by 6 ft. 6 in. and is 2 ft. 9 in. high; it is made of six 2 in. \times 3 in. uprights to which are nailed four rows of 1 in \times 3 in. bars, 7 $\frac{1}{2}$ in. apart; shelter is provided by a piece of corrugated iron fixed to the lower three bars below it. The 7 $\frac{1}{2}$ in. space allows the young pigs to pass to and fro. A trough of 5 gallons capacity is placed in each pen. The cost of such a pen does not exceed 15 pesos (about 26s).

The pens are placed in lucerne fields 20 yds. apart in rows 120 yds. apart. Litters of different ages should not be allowed in the same row or the bigger ones will enter the pens of the younger and interfere with their sucking. When breeding is carried out all through the year, 10 pens are sufficient for 300 sows. After the pigs are weaned the sows are allowed to pasture with the boar (1 boar for each 25 to 30 sows) and the sows near farrowing are removed to the pens each week.

The pens are moved each day to provide fresh clean pasture; the men can move 100 pens in an hour. Fresh water is supplied each morning and about 7 lbs. of maize is allowed each sow in the afternoon. Weaning takes place at the age of 2 $\frac{1}{2}$ to 3 months, and to simplify the work it is better to wean those of a row at the same time. After weaning the males are castrated, and all are marked and given an insecticidal bath. They are then put out to pasture until 1 year old.

At least one shed 25 yds. \times 6 yds. should be provided for every pigs to afford them shelter in bad weather. From $\frac{3}{4}$ to 1 lb. of maize head is allowed daily. At one year old they should weigh about 110 50 lbs.; they may then be fattened if desired by turning them into a re field. With a good crop of maize 250 acres will fatten 1000 pigs to 4 months. During this period the fattest are chosen and sent to the ket. If possible the crops should be arranged so that the lucerne s surround the maize crop, thus enabling the pigs to prevent an attack xousts.

The economics of this system under Argentine conditions are as follows ing the dollar at 18 9d) :

Initial Expenditure :		£
6 200 acres at about £5 12s		35 000
Buildings, etc.		8 750
1 000 sows at £3 10s		3 500
40 boars at £8 15s		350
First year's expenses		6 562
Total	£	54 162
Initial Expenditure :		
Interest on capital at 8 %		4 333
Labour; 8 or 10 peons		875
Maize for rearing purposes		3 500
Cultivation of 2 200 acres of maize for fattening		1 312
Sundry expenses		1 355
	£	11 375
10 000 pigs, weighing 220 lbs. each		29 875
Profit	£	17 500

- Comparative Experiments on Pigs in the State-subsventioned Breeding Districts of Denmark. — Eighty-fifth Report of the Royal Veterinary and Agricultural College in Copenhagen.

In Denmark there are practically only two breeds of pigs : the Danish the Large White Yorkshire.

The Danish breed, to which by far the majority of the pigs in the try belong, is the most resistant and prolific, and its offspring possess greatest vitality, but at the slaughterhouse it is inferior to the Large ite, which is especially good in this respect. A good breeding animal roduced by crossing the two breeds.

But the greatest efforts are being made to improve the native breed selection and pure breeding, and encouragement for this is given in ous ways, the chief of which is the granting by the State of a moderate uly sum to owners of herds of pure-bred well built animals who are posed to breed the pure strains and to place their herds under public ntrol; for this, besides the grant, they get recognition from the State as nging to a breeding district.

15 per farm; the average value of each bird is 42 cents so that the farmer's average investment in fowls is only \$ 56.49. About one half of the birds are pure bred. For small farms Plymouth Rocks are most popular, while the larger ones Leghorns seem to be preferred.

From the monthly records submitted to the Poultry Department of the Experiment Station by farmers of the State, it is found that where Leghorns, Plymouth Rocks, Wyandottes or Rhode Island Reds were fed only, the average egg production ran from 52 to 70 eggs per hen per year. Where mill by-products, and meat scraps or milk were added, in these same breeds the minimum production was 66 eggs and the maximum 124, most of them averaging over 85.

In 1911 and 1912 at the Purdue Experiment Station an experiment was carried out with Leghorn pullets in which all pens were fed corn, wheat, oats, bran and shorts in the same proportion. One pen had in addition 10 per cent. meat scraps, and another pen sufficient skim milk to equalize the amount of protein contained in the meat scraps. In reality the latter meant about as much milk as the chickens would drink. The result of two years' work was that the meat scrap pen produced an average of 55 eggs per year per hen, the skim milk pen 135.5, and the pen without meat or milk 36 eggs per bird per year. The cost of feed per hen was respectively \$ 0.915, 1.085 and 0.73.

In the pen receiving milk, the egg production through the winter months (November-February) averaged almost seven per cent. more than in the pen fed meat scrap. For every \$ 2.50 invested in 100 lbs. meat scraps the return was \$ 24.50 and for every 30 cents invested in 100 lbs. of skim milk \$ 1.73 was returned.

About one third of the farmers that answered the questions use incubators.

At the Purdue Experiment Station good results have been obtained in brooders. The best results have not been obtained from lamp-heated brooders but by a wooden brooder house heated by a gasoline burner. The brooder is an eight-foot square colony house 6 ft. 6 in. high to the comb with an A-shaped roof, placed on runners so that it can easily be moved. The wood and material for such a house will cost about \$ 15 and the heater

Egg-Laying Competitions in Australia. — I. Egg-laying Tests at the Hawkesbury Agricultural College, Twelfth Year's Results. — *The Agricultural Gazette of New South Wales*, Vol. XXV, Part 5, pp. 421-433 + 2 plates. Sydney, May 1914. — II. HART, A. (Chief Poultry Expert) Report on third Egg-laying Competition at Burnley, 1913-14. *Journal of the Department of Agriculture of Victoria*, Vol. XII, Part 6, pp. 353-362 + 7 figs. Melbourne, June 1914.

I. — *Twelve years of egg-laying tests at the Hawkesbury Agricultural College.*

In the accompanying table are summarized the results of the twelve years of egg-laying competitions, the last of which concluded on March 1914.

In this year the innovation introduced was the single-pen system testing individual hens in groups of six, and it revealed great individual differences; for instance in one group the best laid 224 eggs, the worst 188, and five exceeded 200. The test of judgment in selection, in which ten breeders supplied duplicate pens of six hens each, selected respectively as "good" and "bad" layers, confirmed the results of the preceding year, the average laying of the "good" pens being 14 eggs, and the value 1s 8d per hen per annum more than the "bad" ones. The winner of the section was able to select hens that gave a return of £ 1 8s 7d more than his six "bad" hens.

In the 1913-14 competition in all the sections, 660 birds took part. The breeds represented were: White Leghorns, Brown Leghorns, Black Orpingtons (one group of which exceeded the collective total of all other pens of heavy breeds), Silver Wyandottes, White Wyandottes, Minorcas, Plymouth Rocks, and Langshans.

	Winning total	Lowest total	Average per hen	Average value per hen		Cost of feed per hen		Profit over feed	
				s.	d.	s.	d.	s.	d.
1st	1 113	459	130	15	6	6	0	9	6
2nd	1 308	660	163	17	9	5	9	12	0
3th	1 224	532	152	12	9	4	6	8	3
4th	1 411	635	166	13	3	5	3	8	0
5th	1 481	721	171	14	10	5	10	0	0
6th	1 474	665	173	17	2	7	0	10	2
7th	1 379	656	180	19	2	7	10	11	4
8th	1 394	739	181	21	9	6	9	15	3
9th	1 321	658	168	16	6	6	4	10	1
10th	1 389	687	184	18	5	6	1	12	4
11th	1 461	603	178	19	4	7	3	12	1
12th	1 360	724	177	17	7	5	9	11	0

II. — Third egg-laying competition at Burnley, 1913-14.

The first yearly test conducted in the State of Victoria was at Deakin College in 1904-05 under the supervision of the Principal. This test was won by six White Leghorns, which laid 1313 eggs during the twelve months. In the next two yearly tests the winners were six Silver Wyandottes with 1296 eggs and six White Leghorns with 1314 eggs respectively.

If these figures be compared with those of the winning birds at the recent test at Burnley, the great improvement in the egg-producing quality of White Leghorns will be seen.

In the 1913-14 test 63 pens of six birds each competed. Of these 54 contained White Leghorns, 5 Black Orpingtons, 2 Black Span

each Golden Wyandottes and Rose-combed Brown Leghorns. The winning pen of White Leghorns produced 1667 eggs during the twelve months, being an average of over 277 eggs from each bird. This pen also produced the greatest number of eggs during the four winter months, namely 533. The value of the eggs produced by the winning pen, at 1s 2d per dozen, was £8 2s 2d, which leaves a profit of £1 1s 4d from each bird over the cost of food. The twelve best groups produced an average of 1251 eggs each for the year. The whole of the birds competing in the year averaged over 212 eggs each for the year, with a profit of 15s per bird over the cost of the food. In the heavy breeds the best pen of six Black Orpingtons laid 1216 eggs in the year.

Taking the average egg production, the White Leghorns are easily first, with an average of 216 eggs per bird. The averages for the other breeds were: Black Orpingtons 190, Black Spanish 180.7, Golden Wyandottes 172, and Rose-combed Brown Leghorns 169.

35 - **Bee-keeping in Portorico.** --- PHILLIPS, E. F. (Bureau of Entomology, U. S. Department of Agriculture) in *Portorico Agricultural Experiment Station Bulletin* No. 15, 24 pp. + 4 figs. Washington, 1914.

The Portorico Agricultural Experiment Station at Mayaguez has been interested in bee-keeping since 1908. In 1913 the Station and the Portorico Board of Agriculture requested the writer to inspect the conditions of bee-keeping in the Island. The present Bulletin is the report of the above inspection, which was carried out in May and June 1913.

Before the American occupation, it may be said that bee-keeping did not exist at all in Portorico. There were, however, numerous swarms of wild bees (introduced perhaps at the time of the Spanish conquest), the honey of which was collected. In 1908 the Portorico Agricultural Experiment Station imported five swarms of Italian bees and began to give practical instruction in bee-keeping. This was the beginning of the industry in the Island. Bees multiplied wonderfully in Portorico, and now the initial swarms have become several thousand.

Bee-keeping is practised especially in the western part of the Island and chiefly in the neighbourhood of Mayaguez, mostly on an industrial scale, as every bee-keeper has from two to three hundred colonies and some upwards of five hundred. Italian bees are almost exclusively kept. Some have experimented with Cyprus or Carniola bees; it must, however, be mentioned that the former gave decidedly negative results in the United States and in consequence are not recommended. The Langstroth hive with ten-bar frames is generally used with one or two lifts for the storage of honey, separated from the brood combs by a queen excluder. The bees collect honey almost all the year round, hence the production of honey is very heavy. Productions of from three hundred to five hundred pounds of honey per hive are recorded. It may be stated that a good bee-keeper in average localities produces about three hundred pounds of centrifugated honey per annum. The honey is collected several times in the course of the year. Only centrifugated honey is made, and it is sold in barrels containing 50 American

gallons. According to the writer sufficient attention is not paid to the production of and trade in wax.

Foul brood (1) is unknown in Portorico, and in order to prevent its introduction it is forbidden by the law of September 3, 1913, to import into the Island hives or parts of hives, eggs, larvae, etc. Only queens may be imported, each with not more than 30 workers and enclosed in boxes. These are examined at the port of entry by the Board of Commissioners of Agriculture. But as foul brood is more likely to be imported with infected honey than with bees, a Bill has been presented with the object of forbidding the importation of honey which cannot be proved to come from healthy hives.

The exportation of honey from Portorico has risen during the last five years (1909-14) from practically nothing to about \$100,000. The difficulty and the cost of transport still constitute the most serious obstacle to the development and spread of bee-keeping in the mountainous Island of Portorico.

As for the plants supplying nectar for the bees, the trees used to shade coffee plantations are excellent; for this reason bee-keeping is chiefly practised where coffee is grown. The principal plants for bees are: *Inga laurina* ("guama"), *Inga vera* ("guava"), very good shade plants for coffee in bloom almost all the year round; *Boystonea beringuena* ("palma real"), *Cocos nucifera*, abundant throughout the Island; *Spondias lutea* ("jobo"), *S. purpurea* ("cirvela"); *Andira jamaicensis* ("moca") or "cabbage tree"; *Drypetes glauca* ("palo blanco" or "varital"); *Coffea arabica*, largely cultivated in the mountainous part of the interior of the Island, but its flowers fall soon so it has not the same value for bees as its shade plant *Cupania americana* ("guara"); *Jambosa jambos* ("pomarosa", rose apple); *Mangifera indica* — the bees are also found on the over-ripe fruit of this tree which fall to the ground, but they do not injure the sound fruit; *Persea gratissima* (alligator pear); *Lantana* spp. ("lantana" or "cacaquillo"); *Borreria ocymoides* ("botoncillo"); *Musa* spp.; oranges, lemons and other citrus fruit, plentiful in the island, either wild or extensively grown; *Agave* spp.; *Pithecolobium* spp.; *Hymenaea baril* ("algaroba").

The following plants, which in other countries have been observed supplying food to bees, are frequent in Portorico: *Avicennia nitida*; *Cassia* spp.; *Gossypium* spp.; *Hippomane mancinella*; *Melilotus* spp.; *Nicotia glauca*; *Erythrina* spp.; *Paritium tiliaceum* or *Hibiscus tiliaceus*, the fibre of which is used for making ropes; *Haemotoxylon campechianum*; *Sesuvium officinarum*; *Acacia* spp. etc.

1036 — **Economical Methods of Rearing Silkworms.** — FORNACI, C., in *L'Italia Agricola*, Year 51, No. 9, pp. 401-404. Piacenza, September 15, 1914.

This new system of rearing silkworms aims at more hygienic conditions and a greater economy in leaves and labour. It enables the same number of worms to be reared as by the Lombard method, without requiring too great changes from the system in general use. It consists essentially

(1) See No. 1202, B. August 1912.

the use of shallow trays with permeable bottoms, which allow air to pass and the excreta to fall, while the largest possible quantity of the silkworms can be fed attached to the twigs.

From the time of hatching to the third moult, the worms are reared on trays made from reeds covered with paper and fed on loose leaves. The system of rearing is used after the third moult and consists of tiers of trays made of reeds bound together with spaces nearly half an inch between each tray. The alternate trays are covered with paper or cloth so as to catch the excreta from the one above. The bases of such trays can thus be replaced by wire mesh frames of metal wirework, bare or covered with paper or cloth according to requirements. The trays are placed in pairs 8 to 12 in. apart and are 24 in. between the pairs. Two days after the third moult mulberry shoots 16 to 20 in. long are given plentifully to the worms; when the worms have been defoliated they are moved, with the worms on them, to the next trays. During the period between the third moult and pupation some of the accumulated branches should be removed and the worms thinned out so that at the time of pupating the space allowed should be about 15 sq. feet per gram of eggs.

A further saving of space may be obtained by placing a light cloth board under each tray to catch the excreta; this need be only 4 to 6 in. deep under the tray.

The superiority of this system has been demonstrated in the experiments carried out by the travelling lecturer of Gallarate in 1914. This year's results show:

- 1) a greater economy of space than with the Lombard system;
- 2) more hygienic conditions for the worms and very low mortality "flacherie" and "jaunisse";
- 3) a saving of 4 to 6 cwt. of leaves per ounce of eggs;
- 4) a saving of $\frac{1}{4}$ to $\frac{1}{3}$ of the labour required by the old system;
- 5) a minimum of expense in effecting the improvements;
- 6) a better quality of silk and heavier cocoons, going 30 less to the ounce than with the old system.

Report on Sericultural Experiments in France during 1913. — LAMBERT, M., *Bulletin Mensuel de l'Office de Renseignements Agricoles*, Year 13, No. 5, pp. 593-595, May 1914.

On the 30th of July 1913, the French Parliament voted a sum of £100,000 for the encouragement of sericultural experiments. This was divided as follows: £160 was granted to the Department of Science and Education, £1840 to the Department of Instruction and Technical Education, and £1840 to the Department of Agriculture and Forestry.

The latter amount was utilised as follows.

Institution of local sericultural competitions	£ 1440
Creation of experiment fields and nurseries for mulberries at the Schools of Montpellier, Antibes, Ecully, Oraison and Valabre	200
Distribution of young mulberry trees and silkworm eggs in batches of 5 gms. for each experiment, to private persons, schools of agriculture and primary schools	120

4. Installation of material at the Sericultural Station of the School at Montpellier for comparative experiments on silkworm rearing by different methods, and expenses of the organisation of competitions and experiments. £

The local competitions were held in 36 cantons belonging to 18 departments. The number of silkworm rearers, farmers or silkworm egg-brokers taking part was 743. The members of the visiting commission chosen, as for previous competitions, as far as possible amongst people living in the particular departments concerned.

The carrying out of these dispositions was entrusted to an Interdepartmental Commission nominated by the Minister of Agriculture. It visited the 743 farms between October 1913 and January 1914. Of number 585 were considered worthy of being recommended to the Ministry for reward.

In the course of its visits the Commission made the following observations:

- 1) It is easily possible to determine with sufficient accuracy the quality of the products of the competitors at other times than the periods and to classify them according to their merits.
- 2) The great majority of rearers hatch under defective conditions. Worms are often reared in small unhealthy rooms, and the cultivation of the mulberry leaves much to be desired.
- 3) The rearers accept the advice offered by the Commission and are disposed to profit thereby.

With regard to the distribution of young mulberry trees, it has been possible to give satisfaction to all requests. The number distributed has reached about 10 000.

1938 - **Fish Breeding in Switzerland in 1913.** — *Schweizerische Fischerei Zeitschrift*, Year 22, No. 5, pp. 122-126. Pfäffikon, May 1914.

During the breeding season 1912-13, 191 fish-breeding establishments were in activity, as against 192 in the preceding year. The area occupied by the incubation nurseries was 6943 square feet and the number of incubation glasses was 591. Out of 121 550 550 eggs 97 422 880 fishes were hatched. Of this number, including 60 302 summer fish and one-year-olds, 97 13 (in 1911-12 81 050 630) were placed under State control in public waters.

The kinds of fish that were incubated are as follows:

	numbers
Salmon	1 292 400
Salmon hybrids	103 000
Lake trout	2 546 800
River and brook trout	7 373 030
Char	4 350 050
Grayling	2 227 500
White Fish (coregonus)	70 809 100
Pike	8 370 500
Perch	90 000
Eels	146 000
Foreign species	93 500
Brook char	21 000
	<u>97 422 880</u>

In order to defray the expenses of incubating and setting out the fry, the Confederation granted the Cantons the sum of £ 1385 (against £ 1300 in the preceding year) which was distributed among the owners of the piscicultural establishments.

In the above figures the work done in the Canton Valais is not included, as no data have been supplied.

The number of fishery inspectors in the service of the Cantons was, in the year reported upon, 170, to which at times are added 11 assistants; the fees, daily and travelling expenses, amounted to £ 3981, against £ 3747 in 1912. The Confederation contributed one half of these sums. For the destruction of animals injurious to fish the Cantons spent £ 35 7s 6d, to which the Confederation contributed £ 16 11s.

In these figures on the inspection of fisheries, the Canton of Geneva is not included, as it did not ask for a grant or send in any report.

The Swiss Fishery Association received, as usual, a grant from the Confederation of £ 158.

The International Fishery Association for the Lake of Constance was aided by the Confederation, as well as by the other States bordering on the lake, a sum of £ 12 towards the expense sustained in 1913 for restocking the lake with fry.

On May 2, 1913, the Federal Council issued an Order concerning fishing regulations common to Italy and to Switzerland, as a supplement to the agreement of June 13, 1906, and which entered into force on June 1, 1913.

FARM ENGINEERING.

Report of the International Competition of Motor Tillage Machines at Chaouat, Tunis, in 1914. — *Direction Générale de l'Agriculture, du Commerce de la Colonisation, Bulletin*, Year 18, No. 79, pp. 445-503. Tunis, July 1914.

An international competition of motor tillage machines was organized by the General Direction of Agriculture of Tunis and held at Chaouat from the 5th to the 23rd of April 1914.

About 750 acres of stubble land were devoted to the trials of the various machines, twenty-four of which were entered, but, owing to various circumstances, only nineteen took part in the trials. Of these, nine were tractors, two portable engines with windlasses, four motor ploughs and four rotary tillage machines, including one hoeing machine.

The machines tried were the following:

Tractors. — America; Avery; Caterpillar; Case; Emerson (Big Four); Ransomes; Rumely; Titan.

Portable engines with windlasses. — Two Franco-Hungarian portable engines.

Motor ploughs. — Moto-aratrice (Pavesi and Tolotti); D. K.; Stock; Akra.

Rotary tillage machines. — Charmes; Coupin; Motoculture française.

Hoeing machine. — Bauche.

Machine	Time employed in actual working	Area ploughed acres	Depth of furrow inches	Consumption of fuel and oil	Fuel per acre	Cost of fuel per acre (2)	Area ploughed in 10 hours acres
<i>Tractors:</i>							
America (1) 40-50 HP. With six-furrow plough	2	3	2.47	8.58 gals benzine	3.47 gals	3	11.86
Avery 80 HP. With eight-furrow Cocksbutt plough	2	31	4.94	16.02 gals benzine 10.62 gals benzine 1.81 lb. oil	2.15 gals	3	19.64
Big Four 55-60 HP. With six-furrow John Deere plough	3	11	6.03	0.92 gals benzine 23.69 gals Atlantic petrol 2.64 lbs. oil	0.15 gals benzine 3.94 gals petrol	3	18.94
Case 40 HP. With six-furrow plough, but only three shares working	4	5	3.46	13.11 gals Atlantic petrol 3.47 gals benzine	3.70 gals petrol 0.97 gals benzine	4	8.44
Caterpillar 60 HP. With eight-furrow Deere plough, only six shares working	4	20	6.67	22.44 gals Atlantic petrol 4.03 lb. oil	3.36 gals petrol 0.36 gals benzine	3	15.39
Mogul 60 HP. With six shares in two independent frames	4	32	7.14	33.5 gals Atlantic petrol 24.2 lbs oil	4.70 gals petrol	3	15.74
Ransomes 35-40 HP. With four-furrow Ransomes gang plough	5	7	5.41	17.59 gals Adriatic petrol 1.98 lbs. oil	3.26 gals petrol	2	10.58
Runnely 30 HP. With four-furrow plough	4	8	4.72	22.73 gals Adriatic petrol 3.86 lbs. oil	4.65 gals petrol 0.34 gals benzine	3	11.42
Titan 45 HP. With plough with four independent shares	4	0	4.03	19.28 gals Adriatic petrol 11 lbs. oil	5.0 gals petrol	3	9.65
<i>Portable engines with windlasses:</i>							
Franco-Hungarian (16-20 HP) water-gas engines with Rud. Suck five-furrow plough	2	36	2.00	115.76 lbs charcoal 26.00 gals water	37.88 lbs charcoal 13 gals water	1	5.48
do. do. with a one-share Bajac plough	2	37	0.56	17.97 lbs charcoal 3.47 gals water	21.07 lbs charcoal 51.66 gals water	5	3.73
<i>Motor ploughs:</i>							
Moto-aratrice 16-20 HP. (Pavesi and Tolotti) with three shares fixed in front	4	14	3.04	9.28 gals benzine 2.11 lb oil	3.04 gals benzine	4	1.97
D. K. motor plough, 80-95 HP with three shares	2	22	5.68	11.48 gals benzine 6.96 lbs oil	2.00 gals benzine	3	3.27
Stuck, motor plough, 42-50 HP	2	36	6.52	11.33 gals benzine	1.74 gals benzine	2	10.07
<i>Rotary tillage machines:</i>							
Chapman's cultivator 36 HP	8	52	3.36	31.02 gals benzine 3.22 lbs benzine	6.51 gals benzine 8.90 gals benzine	10	7.45
Reverend's motor cultivator, 30 HP	4	4	1.64	13.74 gals benzine	3.22 gals benzine	4	4.29

The land was situated in the extensive plain of Chaouat. The soil very homogeneous, compact and dry, so that the heaviest machines but little into it.

Most of the trials as to consumption of fuel were carried out on strips 10 feet long by 98 wide.

The accompanying table (opposite) summarizes the results of the trials. Only the cost of the fuel used is given, as the total cost of work depends upon several variable factors, the chief of which are amortizement, which in its turn varies considerably with the amount of work done in the course of the year, the quality of the materials used, etc. As already stated several dynamometer trials were also made, the results of which are given in the Report. The depth of work was regulated so as to require a fairly constant traction together with a maximum effect on the tractor, without diminishing too much the number of revolutions of the motor.

The average effort ranged from 1015 to 1624 lbs. per square foot. The soil requiring an effort of 1421 lbs., a furrow about 8 inches deep by the machine demands a team of eight mules or 12 native oxen.

- **The Reaper-Thresher.** — SHAW, J. W., in *The Agricultural Gazette of New South Wales*, Vol. XXV, Part 5, p. 376. Sydney, May 2, 1914.

The Reaper-Thresher, more commonly known as the "header", is a comparatively new machine and is becoming more popular from year to year.

One great difference between these machines and a harvester is that the heads instead of being stripped or combed off are cut off by a knife which is worked at the rear of the comb. The straw is drawn through the comb until the heads, assisted by the reel, come in contact with the knife. The fact of the heads being cut greatly lessens the draught. Should the reel be soft or the straw weak, the wheat is not pulled up by the roots and choked in the comb, nor is there any choking when the crop is dirty with thistles or other weeds.

When the heads are cut they are carried by means of the reel on to canvas conveyors at the rear of the comb, which then carry them to the feeder of the threshing drum; this drum is very large and by means of pinions its speed may be varied to meet varying conditions. A second drum is placed at the rear of the machine to re-thresh any broken heads which may have escaped the first threshing.

The straw is thrown out at the side at the rear of the wheels. The wheat is fed evenly on to the riddles, where it is winnowed, and is then carried by elevators into the grain box, which has a capacity of five bags. The machine takes an eight-foot cut, and with two average teams of horses each, in a fair crop, from 15 to 20 acres may be harvested in a day. There is very little waste of grain as compared with some other reapers, and the lightness of draught and its power to deal with a weedy crop make the header a most valuable addition to the wheat grower's equipment.

1041 - **Straw Press Binder with Two Pincer-like Groups of Arms working together** — *Maschinen Zeitung*, Year 12, No. 8, pp. 92-93. Berlin, April 15, 1914.

A new straw press for tying straw into bundles as it issues from threshing machine has been devised by Messrs. Volkenborn of Lamsberg, and patented in Germany under No. 270 841.

It consists of two pincer-like groups of arms, which are moved toward each other by the action of one hand lever.

The press is shown open in fig. 1, half closed in fig. 2, and closed in fig. 3.

It consists of a frame a_1 a_2 and a cross piece b , on which the arms d and d' are fixed to the pivots f and g . The arm d is connected by the link h , hinged in i to the hand-lever m , the fulcrum of which is in k on the cross-piece b .

The other press arm c is worked by the bar o , which rests on the pivot p and is joined to the hand-lever m in n . This bar carries a roller q which runs along the bottom of the lower branch r of the arm c .

The lever is so arranged that the pressure increases towards the end of the operation and that when the press is in its closed position (fig. 3) the lever is pressed against the bolt s and kept there.

Thus, by a simple movement of the lever m , not requiring any great exertion, the straw is pressed and kept so until tied.

In order to prevent fresh straw from the threshing machine sliding down the inclined plane y onto the binder, the arm c carries a kneading bar t which raises the straw fender x and keeps it there till the press is opened.

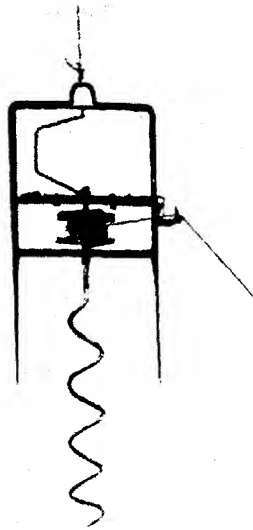
1042 - **Swift's New Hay Elevator Fork.** — *The Implement and Machinery Review*, Vol. No. 473, p. 682. London, September 1, 1914.

The accompanying illustration shows the new hay fork elevator for the building of haystacks, devised by Mr. A. J. Swift of Eccleston, Lancashire. The spiral stem and the two side spikes are, by four or five turns of the crank in the upper part of the fork, pressed down into the hay to grip a load. When the load is elevated to the desired height the operator simply pulls a rope gently, causing the spiral to unwind, when the load falls off into several different places on the stack instead of being dumped in one heap.

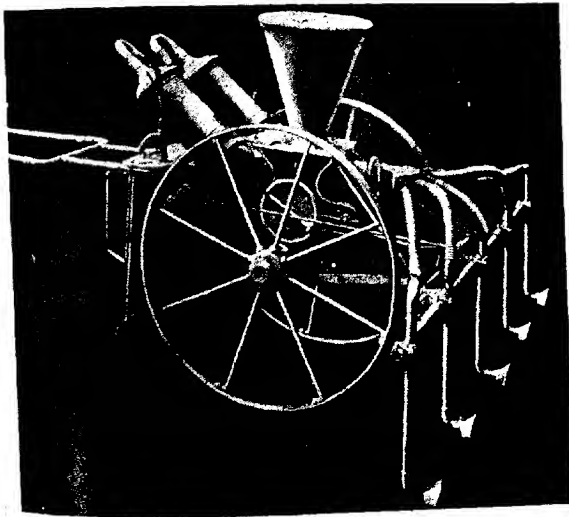
1043 - **Machine for Pickling Seed Wheat.** — ARVAY, ERNST, in *Wiener Landwirtschaftliche Zeitung*, Year 64, No. 15-4916, p. 135. Vienna, March 14, 1914.

It often happens in practice that smut appears on the crop notwithstanding the pickling given to the seed. This is due to the careless way in which the pickling is usually conducted, and which often consists in rapidly dipping baskets containing the seed into fungicide solution. Besides being unreliable, this process is also costly as it requires a great deal of labour.

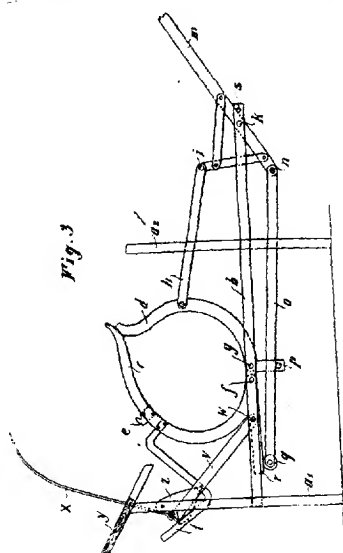
In order to avoid these drawbacks the writer devised and constructed a pickling machine which consists of a trough made of pure copper, to contain a solution of copper sulphate, in which a horizontal drum is



Swift's Hay Elevator Fork.



Randell's Dry Sprayer.



STRAW PRESS BINDER.

Fig. 1. — Open.
Fig. 2. — Half closed.
Fig. 3. — Closed.

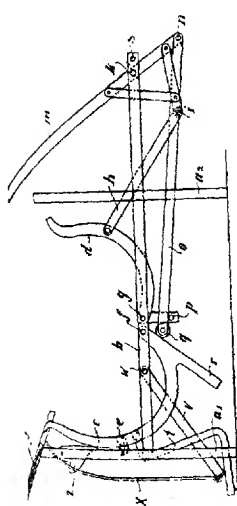
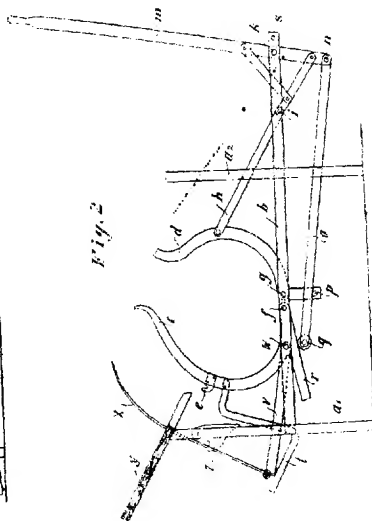


Fig. 2



with minute holes revolves. The seed is poured into a hopper, the out which can be closed by a slide, whence it falls into a channel leading the drum. In this an endless screw pushes the wheat along slowly that it stays from three to five minutes in the solution, every grain wetted by it. At the other end of the drum another screw ejects pickled grain.

With this simple machine a saving of about three-quarters of labour required by the primitive method is effected and the work is thoroughly.

1044 - **Randell's Dry Sprayer.** — *The Implement and Machinery Review*, Vol. 40, N p. 559. London, August 7, 1914.

Among the machines exhibited at the Royal Agricultural Show at Shrewsbury in July of this year there were two entirely new machines for dry spraying built by Messrs. F. Randail and called the "St. Perfect". One was fitted with five nozzles, as in the accompanying illustrations, for spraying as many rows of potatoes, for large farms, the with two nozzles for small holdings. The blast is not produced by but by two cylinders and pistons, which run at much less speed, but a continuous blast and requiring less power to drive, a small power sufficient.

An agitator is provided and the feed is so arranged that any quantity of powder can be sprayed. Roller bearings are used throughout. price of the larger machine is £30 and of the smaller one £15.

1045 - **Wallace's Portable Milking Machine.** — *The Implement and Machinery* Vol. 40, No. 473, p. 672. London, September 1914.

Now that the importance of the purity of milk is universally recognized, out of door milking is advocated as a means of ensuring cleanliness than indoor work. In order to facilitate milking in the Messrs J. and R. Wallace of Castle Douglas, Scotland, have developed a portable milking machine. This plant consists of a portable house portable wooden framework to which the cows can be tied. The contains a 3 ½ HP. Capel petrol-paraffin engine connected to a vacuum pump and a vacuum storage tank. An iron pipe is fixed along the side of the frame just above the cows' heads and this is connected to the vacuum tank and pump by a flexible steel tube. The framework provides accommodation for twelve cows, the animals being held during milking by a holding bar which grips them behind the head. Six cows are milked at a time and directly one is finished another takes its place. Each day the machine is moved to a different part of the field so that the cows always graze on clean grass.

1046 - Review of Patents.

Tillage machines and implements.

Austria	66 708. Skid for wheels to facilitate the turning of tillage machines.
Canada	154 074. Rotary plough.
	154 093. Stone-picking machine.
	154 270. Plough.

- 154 304. Plough fender.
- 154 308. Weeder.
- 154 334 and 154 352. Ploughs.
- 154 374. Harrow.
- 154 476. Plough mechanism.
- 154 552. Plough.
- 154 781. Machine for hoeing potatoes.
- ark 19 032. Motor plough.
- 19 118. Shares for rotary plough.
- 19 124. Motor plough.
- t 469 985. Hoeing machine with balanced rotating axles.
- us 274 831. Cleated tyres for the driving wheels of agricultural machines,
especially motor ploughs.
- 274 936. Mould board built in two parts, especially for reversible ploughs
with two shares situated back to back.
- 274 958. Tillage machine with revolving drums bearing hoes.
- 137 728. "Campione" motor plough.
- 141 652. "Ronco" plough.
- j Kingdom 7 118. Cultivators.
- 8 595. Trench excavator.
- 9 880. Steering gear for motor ploughs.
- 9 992. Side share for ploughs.
- 10 276. Digging machine.
- j States 1 103 450. Combined clod cutter and crusher.
- 1 103 284. Harrow.
- 1 103 293. Subsoiler plough attachment.
- 1 103 543. Plough adjusting mechanism.
- 1 103 595. Cultivator blade.
- 1 103 929. Land roller.
- 1 104 027; 1 104 293; 1 104 329. 1 104 636. Cultivators.
- 1 104 187. Plough lift for gang ploughs.
- 1 104 569. Plough.
- 1 104 748. Disk harrow.
- 1 105 032. Reversible plough.
- 1 105 198. Cultivator.
- 1 105 450. Three-row wheel corn cultivator.
- 1 106 119. Gang plough.
- 1 106 213. Orchard plough.
- 1 106 312. Subsoil attachment.
- 1 106 190. Machine for gathering stones.

Manure distributors.

- el Kingdom 7 121 and 7 663. Manure distributors.
- el States 1 104 247. Agitator and feeder for fertilizer distributor.

Drills and sowing machines.

- ca 154 156. Corn planter.
- may 274 832. Combined potato laying machine and manure distributor.
- el Kingdom 7 345. Drills.
- 7 912. Machine for making holes for planting potatoes.
- 9 931. Potato planters.

- United States 1 103 299; 1 104 214. Corn planters.
 1 103 593. Marker for corn planter.
 1 103 831. Seed planter.
 1 104 602. Attachment for grain drills.
 1 104 725. Potato planter.
 1 105 075. Seeder.
 1 105 665. Corn planter.
- Reapers, mowers, etc.*
- Austria 66 663. Fastening for the tines of tedders, rakes and the like.
 Canada 154 078. Sheaf loader.
 154 132. Harvester.
 154 160. Grain rake.
 154 166. Hay gatherer and loader.
 154 339. Sharpener for lawn mowers.
 154 356. Hay press.
 154 361. Harvester mechanism.
 154 464; 154 472. Railway mowers.
 Denmark 19 113. Device for binders.
 Germany 274 699. Apparatus for conveying the reaped cereals to the binding
 mechanism in binders.
 274 748. Process and apparatus for drying clover.
 United Kingdom 6 578. Track clearer for mowing machines.
 7 215. Lawn mowers.
 9 443. Reaping and mowing machines.
 United States 1 103 766. Corn harvesting machine.
 1 104 020. Tooth for hay rakes.
 1 104 213. Header device.
 1 104 240. Binder sickle guard or tooth.
 1 105 235. Harvester.
 1 105 445. Pea harvester.
 1 105 751. Mowing machine.
 1 106 018. Harvesting machine.
- Machines for lifting root crops.*
- Austria 67 010. Beet topping machine.
 Canada 154 098. Potato separator.
 154 180. Potato digger.
 Denmark 19 082. Potato lifter.
 19 094. Beet topping apparatus.
 Germany 274 623. Machine for collecting and sorting potatoes.
 United Kingdom 7 084. Potato harvester.
 United States 1 103 321. Potato digger.
 1 105 327. Potato sorting apparatus.
 1 105 427. Potato sorter.
 1 105 728. Beet harvester.
- Threshing and winnowing machines.*
- Austria 66 664. Automatic feeder for threshing machines with apparatus
 cutting the sheaf tie.
 Germany 274 667. Automatic feeder for threshing machines.
 274 937. Grading apparatus with fan and several screens with
 planes between them.

- 142 523. Improvements in straw elevators.
 7 971. Improvements in threshing machines.
 1 103 324. Threshing machines for standing grain.
 1 104 033. Attachment for threshing machine feeders.
 1 104 677. Corn sheller.
- Other agricultural machines.*
- 66 347. Apparatus for tying up live stock in stables.
 66 352. Milking machine.
 66 357. Centrifugator for frothy liquids.
 66 450. Milking machine.
 66 655. Drinking trough.
 66 666. Portable circular saw for cutting sugar cane.
 66 674. Device for untying live stock.
 154 102. Wheel jack and belt-tightener.
 154 116. Rossing machine.
 154 139. Milking machine.
 154 198. Cherry stemming machine.
 154 204. Bean sorting belt.
 154 221. Fruit picker.
 154 315. Grain tester and seed separator.
 154 434. Yeast tester.
 154 499. Tree scraper.
 154 632. Milking machine.
 154 675. Fruit grading machine.
 154 786. Grain cleaning mill.
 154 797. Incubator.
 154 838. Churn.
 154 843. Tree sprayer.
 19 033. Device for forks and similar implements.
 19 035. Milking machine.
 19 178. Straw baler.
 274 498. Steering swivel for agricultural machines.
 274 499. Cleaning apparatus especially for cereals.
 274 501. Hand stump-pulling machine.
 274 557. Portable sprinkling apparatus.
 274 624. Device in balers for passing the wire led on both sides of the bales.
 274 666. Apparatus for working agricultural motors by electric power.
 274 700. Straw press.
 274 702. Milk strainer with several filters situated over each other and kept in position by tension rings.
 274 889. Machine for raising clay from moor soils.
 274 938. Machine for slicing beets, potatoes and the like.
 140 473. Hay baler.
 142 047. Automatic watering mechanism.
 142 145. Semi-automatic system of threading the needle for binding the bales in fodder balers.
 142 162. Apparatus for untying animals in stables.
 142 282. Spraying pump with automatic agitator.
 142 289. Apparatus for killing moles.
 142 381. Continuous action machine for crushing and pressing grapes and removing the stalks.

- United Kingdom 6 458. Brooder.
 6 583. Machine for husking and cracking cohune nuts.
 6 729. Germinating boxes.
 7 568. Hedge trimmer.
 7 612. Apparatus for extracting fruit juices by steam.
 7 666. Weed puller.
 7 671. Retting apparatus.
 8 448. Spraying machine.
 8 473. Baling press.
 8 544. Apparatus for reducing wheat by successive grinding by rolling
 9 352. Apparatus for preparing food for animals from peat.
 9 489. Apparatus for drying grain.
 9 554. Baling press.
 9 776. Hay loader and collector.
 9 968. Rubber extractor.
 10 012. Portable root cutter.
 10 037. Traction engine.
- United States 1 103 287. Hay fork.
 1 103 326. Fodder loading apparatus.
 1 103 492. Hay stacker.
 1 103 678 ; 1 104 277 ; 1 105 551 and 1 105 562. Tractors.
 1 103 733. Stacker.
 1 104 312. Hauling device for agricultural machines.
 1 104 431. Fruit gatherer.
 1 104 537 and 1 106 046. Traction engines.
 1 104 847 ; 1 104 934. Traction wheels.
 1 104 885. Stacker.
 1 104 962. Pump.
 1 105 007. Hay press.
 1 105 086. Steering gear for traction engine.
 1 105 686 ; 1 105 862. Tractors.
 1 105 916. Hay and grain loader.
 1 106 202. Milking machine.
 1 106 251. Baling press.

RURAL ECONOMICS.

1047 - The Influence of Machines and Implements upon the Profitableness of Farms of Different Sizes. — *Deutsche Landwirtschaftliche Presse*, Year XXX No. 10, pp. 740-742 ; and No. 61, pp. 749-750. Berlin, July 29 and August 1, 1914

The present paper is a résumé of the discussions and considerations contained in the recent work of Dr. Lichtenberger on the influence of agricultural machinery on the organization and profitableness of farms of different sizes, and which may be summarized as follows :

1. In farms grouped according to size, the relative profitableness of one class as compared with that of other classes is the result of a number of factors among which are included the use of machines and implements together with other economic and natural conditions.

2. Agricultural machinery has proved useful in increasing the profits of farms of all classes of sizes provided natural and economic conditions allowed machines to be used.

3. When farms of different classes of sizes compete with each other under equal conditions, the farm in which natural and economic conditions allow the greatest intensity of farming, will draw the greatest profit from the use of machinery.

4. As a rule, large farms are in the most favourable condition to make profitable use of machines and implements. The relative profitability of such farms is influenced in the highest degree by the use of machinery.

Medium-sized farms occupy in all respects the most difficult position: they require machines just as much as the others but must pay a higher price for their work. Nevertheless these farms also, especially of late, find their profitableness increased by the use of machinery.

In small farms the number of implements and machines that can be profitably employed is limited. This fact, however, does not place small farms in a condition of inferiority to medium and large farms, as the former have no absolute need of machines and implements. On the other hand implements and machines, in so far as they are applicable in the small farms, are of decided assistance in increasing its capacity of competition and its relative profitableness. For this class of farms cooperation in the use of machines is most beneficial.

5. Without entering into the question of comparing absolute conditions, but only examining how far the recent development of machines and implements has altered the relative profitableness of the different classes of farms, it will be found that the use of machinery at first gave large farms a great advantage over the smaller ones; this advantage in respect of medium-sized farms has gradually diminished in consequence of the recent development of machinery and of the steadily increasing intensity of farming. This process has especially been accelerated by the progress of electrical appliances. It is electricity that provides medium and especially small farms with the most suitable motive power. To that extent also the so-called universal machines (namely those that by means of various attachments can be altered so as to perform different kinds of work) assist in spreading the use of machines to the smallest farms.

6. For the calculation of the cost of the work of machines Dr. Lichtenberger considers the figures proposed by Fischer and Lang for amortization and repairs as the most suitable and those which best meet the conditions of small farms. According to them the rate consists of a fixed portion of 8 per cent. per annum of the purchase price and a variable one per day. The former represents interest at 4 per cent. and 4 per cent. amortization. The variable portion is determined in each case by the kind of machine and the number of days in the course of the year in which the machine is used, and varies, according to Fischer, between 0.09 and 0.5 per cent. per day's work. Through the lesser use of machines small farms a compensation within certain limits is obtained between

large and small farms; otherwise on account of the greater purchase cost per unit of performance the amortization and repairs would be absolutely a larger item in small farms than in larger ones. The cost of teamwork should also be reckoned at lower rates in small and medium farms. If, further, the cooperative use of machines and the use of universal machines be considered, the conclusion can be drawn that the cost of machine work limits only to a very moderate degree the relative profitability of small and medium farms.

1048. **The Agricultural Labourers Required on Farms under 100 Hectares (247 Acres in Extent.** — GERLACH, OTTO, in *Archiv für exakte Wirtschaftsforschung*, 15th Complementary Part, pp. 1-13. Jena, 1914.

The Chamber of Agriculture for the Province of East Prussia organized an enquiry in 1901 and 1902 on the conditions of agricultural labour; this was extended also to peasant farms. The writer discusses the results of this enquiry on the amount of labour required, and on the way in which this want was met, in 4600 farms occupying a total area of 197 600 acres. These results are collected in the following table:

Size of farm in acres	Average requirement of				Want of permanent labourers' families	Labour of owner and of his wife
	Permanent labourers		Temporary labourers			
	Number	Days' work	Number	Days' work		
18 to 25	1	300	1	17-20	—	Both work always in all the in
27 to 37	2-3	600-900	1-2	40	not yet felt	" " "
37 to 47	5	1300-1500	2-3	54-60	already felt (in 5; out of 138 farms)	Both generally work
47 to 57	7-9	1550-2500	3	110-115	almost everywhere	The owner works only temporarily. The owner's wife works in the house
57 to 67	8-10	1600-2900	2-5	110-115	is common	The owner works only temporarily and seldom

The usual limit of the size of farms worked by the owner and his wife alone is from 12 to 15 acres. In the above table the data refer to the amount of labour required beyond that of the owner and his wife.

The influence of the distance from the village to the market or to the nearest railway station on the want of labour, could not be determined. A greater influence seems to be exerted by the state of the field roads and the extent of pastures.

On the supply of labour in 1288 farms of all classes of sizes between 10 and 250 acres covering an area of 108 700 acres the following figures afford information:

	On the 1288 farms		
	were required	were available	were wanting
ers of the family.	1 464	1 464	0
aniently occupied labourers' families	870	668	202
servants	3 178	2 193	985

The number of permanent adult labourers required was 5512; of number :

26.6 per cent. was supplied by members of the owner's family.

36.4 per cent. by farm servants.

16.2 per cent. by married helps.

20.8 per cent. was wanting.

The lack of permanent labour is greatest on farms between 50 and 50 acres in extent, being 29 per cent.; it is 28 per cent. on farms between 10 and 50 acres; it ranges from 18 to 22 per cent. on large peasant farms, while on smaller ones it is much less (16 and 12.5 per cent.) and it appears altogether in the smallest farms. The unfavourable position in respect of farms between 35 and 70 acres is explained by the fact that collaboration of the members of the owners' families diminishes considerably, while they are unprovided with housing for labourers' families consequently have to put up with unmarried farm hands, who are most difficult to get.

4 - Influence of Economic Conditions on the Methods of Farming. — AEREDOE, FREDERICH. Special reprint from *Jahrbuch der Deutschen Landwirtschafts-Gesellschaft*. Berlin, 1914.

The total process of development of public economy reacts upon agriculture chiefly by the difference between the prices of production on one hand, and the prices of the means of production on the other, and then also by the reciprocal relations of the prices of the individual agricultural products and of the several agricultural means of production. In an early stage of development of agriculture the prices of agricultural products are low considered absolutely, and especially so in comparison with wages and with the prices of the purchasable means of production. Consequently the aim of the farmer must consist in cultivating large areas of soil with the employment of small quantities of labour and capital so as to ensure for these two factors a large harvest to compensate for its low price. At a higher stage of development, with higher prices for agricultural products and comparatively low prices for the means of production, it becomes advantageous to increase the employment of labour and of live and dead stock per unit of area, so long as a surplus of production can be obtained.

Between these two extremes there are, however, innumerable stages which are characterized in the whole public economy by a progressive saving of the soil following upon its heightened utilization. In agriculture this sav-

ing of the soil and increased utilization is attained by the successive pre-
 rence given to such forms of utilization of the soil as require, it is true
 greater outlay on labour and live and dead stock, but which yield a much
 larger quantity of produce per unit of area, and also by concentrating the
 crops on the old cultivated areas and extending the utilization of the
 to always poorer areas or such as are always more difficult to improve.

This evolution is naturally accompanied by the creation of always new
 systems of farming which differ from each other especially in the following
 characters :

1. In the ratio between the different types of cultivation, especially
 in the ratio between woods and pastures on the one hand, and arable land
 on the other.

2. In the proportion of fallow to arable land.

3. In the proportions of the various crops, especially of hoed crops.

4. In the kind and extent of the crop grown for green manuring :
 especially in the proportion of catch crops.

The evolution of the systems of farming and the degree of its intensity
 thus depend chiefly upon the variations of the above conditions. With the
 general organization of the farm the importance and extent of the indi-
 dual crops and cultural methods vary also and with them the tillage of the
 soil, the manures applied, the kind and quantity of seed, the harvesting, &c.

The writer considers the different degrees of development of a number
 of cultural methods in general and of their application to several places.
 He distinguishes also as regards manuring the following regions of intensity
 or degrees of intensity in the use of farmyard manure, artificials and green
 manures, starting from the lowest or most unfavourable economic con-
 dition :

A. *Regions where farmyard manure and artificials are used :*

1. Regions in which the plant food diminishes.
2. Regions in which it is replaced.
3. Regions in which it is increased.

or

1. Regions that are not manured.

2. Regions in which only farmyard manure is used.

3. Regions in which farm-
 yard manure and artificials are used

}	a) artificials chiefly contain nitrogen; b) artificials chiefly contain phosphates; c) artificials chiefly contain potash.
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B. *Regions in which green manuring is practised :*

1. Regions without green manures.

2. Regions in which green manures are the chief crop.

3. Regions in which plants for green manures are sown among
 reals.

4. Regions with plants for green manures sown among cereals
 after harvest.

With the increasing prosperity of economic conditions the intensity of weeding increases also, with regard to outlay of both labour and capital. The same holds good, especially in the amount of labour, in the regions where weeds are controlled, of which the writer distinguishes ten :

1. Destruction of weeds only by changing arable land into pasture.
2. Do. by fallowing and ploughing between the principal crops.
3. Do. by surface ploughing, cultivating, harrowing, etc., but always means of team work between the harvest and the preparation of the land for the chief crops.
4. Do. by horse hoeing during the growth of the crops. Hand hoeing in gardens.
5. Hand hoeing in field hoed crops.
6. Hand hoeing of wheat; possible through extension of hoed crops.
7. Hand hoeing of oats also, thanks to the still greater extension of hoed crops.
8. Hand hoeing of barley also.
9. Cultivation of rye in spring with Zehetmayr's roller harrow.
10. Destruction of weeds and plant diseases by means of different means.

From the above it will be clearly seen that all means of controlling weeds which entail labour are avoided in the lower stages of development, and in the higher ones those which demand extent of soil are abandoned. The whole change in the development of the measures for the destruction of weeds consists in expending labour in order to save soil, which is effected by concentrating the crops.

In the culture of rye three different regions are distinguished according to the density of sowing, as the quantity of seed diminishes inversely with the intensity of farming.

In the division of the regions of beet growing, the writer considers that of all their position in the rotation while with mangolds he gives greater importance to the methods of culture.

A. Regions in which beets are grown.

1. Beets only in small inner rotation, which through the frequent rotation of hoed crops are kept fairly free from weeds.
2. Beets in the main rotation and for several successive years, in order to facilitate the destruction of weeds at least in the second and third years.
3. Beets in the main rotation in regular alternation with cereals.

B. Regions in which mangolds are grown :

1. Only seedlings planted out immediately after ploughing.
2. Only seedlings planted in levelled and half loosened soil.
3. Partly seedlings and partly sown mangolds.
4. Only sown mangolds.

This table also shows that the object of the farmer must be to get most return from the outlay on labour in the lower stages, and in the higher stages greater returns from the soil area. The same conclusion may be drawn from the succession of the potato regions :

1. Planting the potatoes after ploughing, earthing them up after repeated harrowing. Deep sowing is indispensable.
2. Planting potatoes in well loosened soil, alternately earthing and carefully harrowing; sowing not so deep.
3. Alternate earthing up and hoeing with a horse-hoe lengthwise between the rows.

4. As No. 3, but hoeing crosswise.

5. No harrowing. The destruction of weeds effected only by hoes and chain harrow; in some cases a second hoeing by hand. Superficial sowing.

In this way areas of cultivation for all the other cultivated plants according to the methods of more extensive or more intensive cultivation and corresponding to the more or less advanced stage of economic conditions might be outlined. It is easy to understand that in different stages of development different demands are made upon cultivated plants so that consequently the aims of plant breeding must be different according as the plants are bred for localities of extensive or intensive farming. In order to illustrate this the writer draws up a table in which he compares the two extremes of wheat breeding, namely for extensively and for intensively farmed localities.

A. In the lower stages of farming or in localities situated in unfavourable economic situations, the returns per unit of area are secondary considerations, while the returns obtained by labour and capital are the principal ones; consequently the aims of breeding are:

1. Slight demands as to labour.
2. Slight need of manures.
3. High power of competing with weeds and the like.
4. Easy harvesting by machinery even should the quality of the product suffer.

5. Quantity and quality of straw secondary considerations.

B. In a higher stage of farming or for localities in economically favourable situation, the yields per unit of area are the chief considerations, the yield per day's labour and per unit of capital are secondary matters; consequently the aims of breeding are:

1. High capacity of utilizing the labour spent upon it by high yield per unit area.
2. High capacity for absorbing fertilizers, even if accompanied by loss of thriftiness.
3. The increased care of the plants allows of their possessing a high degree of resistance to weeds and the like.
4. High quality of the harvested grain, even if it should entail greater consumption of labour.

5. High selling value of the straw and large quantities of it, increasing considerably the money value of the harvest.

According as these objects are more or less completely attained in breeding, the importance and the position of the individual cultivation plants change in the course of development. Those plants which give a great increase of harvest best repay the intense care and manuring best

them will acquire most importance. In this connection the writer cares rye and oats. With oats the work of improvement was begun many years earlier than with rye and has obtained superior results. Continually for many years oats have been given an always better position in rotations. From the lowest position it occupied in rotation, it has now to the second place, and where hoed crops cannot follow a green manure crop, oats occupy the first place. Only the later brilliant success of rye breeding have retarded this development, but recently it has received a new impulse from the selection of Lochow's Yellow oats, which possess all the desired qualities in a measure which had never been attained before.

The Influence of the Prices of Agricultural Produce upon the Farming Conditions in Switzerland. — LAUR, E. Reprint from *Schweizerischen landwirtschaftlichen Zeitschrift*, Year 1914, Nos. 26, 27, 28.

Swiss agriculture realized in the period from 1906 to 1913 about 22 per cent more than in the period between 1901 and 1905 for the same amount of production. In the same time the prices of farms, and especially arable pieces of land, have increased considerably. That this rise in prices of land does not always signify an increase of the value of the bare ground is proved by the following figures which show the changes in the value of farms and of the bare soil per acre of cultivable land between the years 1901-05, and that from 1906 to 1912, according to the bookkeeping results obtained by the Swiss Peasants' Secretariat.

% of all the yearly balances from the investigations into profitability.

Per acre of cultivable area	1901-05			1906-12			Increase			per cent.
	£	s	d	£	s	d	£	s	d	
total in:										
.....	70	11	11	72	10	5	1	18	6	2.80
.....	37	4	1	37	10	11		0	5	0.86
ings, improvements and plan-										
ings.....	33	7	5	34	19	6	1	12	1	4.80

If in the corresponding years only the farms that in those years began to have their accounts audited are considered, the results are as follows:

Per acre of cultivable area	1901-05			1906-12			+ Increase — Decrease			per cent.
	£	s	d	£	s	d	£	s	d	
total in:										
.....	72	15	3	77	4	1	+ 4	8	11	+ 6.10
.....	39	19	0	39	7	6	—	11	7	— 1.45
ings, etc.	32	16	3	37	16	8	+ 5	0	5	+ 15.30

From the above figures it appears that on average of all the examined the capital in soil per acre has remained very nearly the same and that the increased price of farms is mostly due to the greater value of buildings, improvements and plantations.

The greater receipts from farming are used in the first place to meet the growing cost of production. According to the observations of the Peasants' Secretariat, the cost of production of crops, not including interest on capital amounted:

in the period 1901-05	to £7 4s 5d per acre
» » 1906-12	» £8 8s 6d
thus increasing by	£1 4s 1d or 17 per cent.

In the year 1912 the cost of production reached £9 4s 2d, or a third more than in the period 1901-05.

The share in the cost of production due to the interest on the capital in soil is mostly much overvalued. Thus, for instance, the average cost of production of milk in Switzerland during recent years was about 3.24d per gallon; of this less than 0.86d is due to the interest on the land, and 1.29 to 1.73d to the interest of the other capital invested in farming. The increase in the cost of production caused by the interest on the capital can not be recognized from the results of the examination of the accounts.

On the other hand the outlay on interest, amortization and value of buildings has increased, and amounts now to 10.8d. The greater demand for labour have much increased the cost of production. Labour alone costs 3.24d per gallon of milk. Wages have increased by 22 per cent., while, due to the use of labour-saving appliances, the average amount of labour required per acre is only 13 per cent. more than formerly. Further, the higher prices of concentrated foods and artificial manures, the greater consumption of which have favoured the greater intensity of farming, have contributed to raise the cost of production. Only through higher prices is it possible for farming to stand this increase in the cost of production.

Under the influence of better prices for his produce, the farmer has been able to attain better living. In farms which did not employ outside labour the cost of living per man-day in 1901-05 was 11.12d and in 1912 12.5d, or an increase of 1.38d or 12 per cent.

In the year 1912 it amounted to 13.25d.

In farms employing outside labour the cost of living has increased to a greater extent, being 14.25d. But as in this period the cost of food has also risen, the nourishment has probably not changed. On the other hand the other items of personal expenses have considerably improved per man unit and year. They amounted to £6 14s 10d per year 1901-05, to £8 12s 1d between 1906 and 1912, increasing by £1 17s 7d or 27.7 per cent. In 1912 they reached £9 18s 3d.

Lastly, the higher incomes have allowed farmers to save more. On average the savings per farm were £44 3s 4d between 1901 and 1911, an increase of £20 7s 7d or 46 per cent. and in 1912 they reached £80 1s 9d.

ly a very small part of these savings was invested in new capital; a certain amount was used for the paying off of debts, but more especially they were devoted to new installations in the farms, to the building of new outhouses, to the purchase of new machines and implements, and to the increase of the live stock.

From the above it will be seen that the increased incomes of farmers, the higher prices of produce, benefited to a great extent other trades, and that on the other hand a fall in the prices of produce with an equal cost of production would spell ruin to the farmers. If the whole of the agriculture of Switzerland, which amounts to about £150 000 000 a year, fell off, a fall in prices of one quarter would be enough to balance this loss.

The gross produce of agriculture in Switzerland amounts at present to 1 700 000; three quarters of this, or in round numbers £28 000 000, is paid. The debt requires, at 4.5 per cent., about £6 700 000 for interest. A fall in prices would thus somewhat exceed the saving of interest.

If the prices of produce lowered below the cost of production, the position of the peasants who had debts would not be improved but would be made worse, because the question of indebtedness is not so much a question of the price of land, which it is hoped to reduce by the introduction of lower prices of produce, as chiefly a question of the ratio of income and the rate of interest. So long as the agricultural net income yields a higher rate of interest on capital than the interest that the farmer has to pay on his debts to the banks, the peasant with scanty capital can work in his farm with borrowed capital and still make a profit. On the other hand, when the low prices of produce cause the net returns from farming to sink below the rate of interest on loans, the peasant with insufficient capital or burthened with debts must end in ruin.

The most efficient method of solving the problem of indebtedness, according to the writer, in adopting in all transactions with farmers, especially in the division of inherited land, their revenue as the basis of valuation.

AGRICULTURAL INDUSTRIES.

Vinification by means of Ferments other than Wine Yeasts. — MARTINAND, V., *Revue de Viticulture*, Vol. XLII, No. 1073, pp. 29-34. Paris, July 9, 1914.

From 1889 to 1901 the writer had studied the specific ferments of fine wine and of the grapes producing them, in collaboration with M. Bérthelot; he has now isolated all the cellular ferments present on the ripe grapes of a celebrated wine. Among them are several micro-organisms which are not yeasts and which yield very little alcohol, but which impart a very agreeable fruity flavour absent from wines fermented only by the wine yeasts.

To determine whether the Burgundy vineyards contain more of these cellular ferments than those of the South of France, the writer repeated

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Pasteur's experiments in a vineyard near the Romanée-Conti proper 60 grapes, only one was found to contain elliptical yeasts; four ap yeasts, two torulae, one fungal yeast (having the characters of both *derma vini* and a yeast) and six ferments causing turbulence in must capable of liquefying gelatine, were also found; the remaining micro-organisms were moulds, *Botrytis cinerea* and *Penicillium glaucum* being nant; two tubes contained no micro-organisms capable of developing must. The bacteria were not investigated in these experiments.

The fact that the true elliptical wine yeasts occurred on only one is in conformity with their general rarity in the vintage.

The organisms other than the elliptical yeasts produce little alcohol but it does not follow that they are not able to utilise grape sugar. evolution of carbon dioxide is not a sufficient index of the activity of ferments of the grapes. Further, these organisms possess in different degrees the power of secreting diastases which dissociate albuminoid material more actively than the yeasts. They are also able to free the must and more or less rapidly from any free sulphurous acid which they contain.

The following means of utilising these ferments in vinification is distinct from the use of selected yeasts and enables sulphurous compounds to be used when desired. Cultures of the selected ferments are made separately or mixed in must containing grape sugar, and they are supplied to vine-growers at the same time as the alcoholic yeasts. They are used as follows: a starter is prepared by cultivating the ferments in must; 100 litres of the must are used for every 100 h. litres of the wine; this is allowed an incubation period of 24 hours. The starter is then added gradually as the must is put into the vat; the culture of elliptical yeasts is added at the same time, without previous incubation. Twenty-four hours after the vat is full, a considerable quantity of must is drawn off from the bottom and added above. Fermentation proceeds very rapidly and it is easy to cool the floating grape-skins by spraying each morning with water from the bottom of the vat.

A culture of selected ferments other than those belonging to *Saccharomyces ellipsoideus* has been employed; it does not produce more than 10 per cent. of alcohol. Another culture of alcoholic yeasts has been employed either to the starter of pure yeasts or direct to the vintage.

Sulphurous compounds, if used, should be applied only during the initial racking off and not on the grapes during fermentation. The amount should be less than in ordinary vinification, and it should only be added after the later racking if the temperature of fermentation rises too high above 35° C. (87° F.).

The writer considers that the selected ferments are used in large quantities in order to dominate the microflora, and the alcoholic yeasts in a less quantity are only able to complete the fermentation of the sugar and form alcohol. The micro-organisms of the selected cultures promote the activity of the alcoholic yeasts. The rapidity of fermentation prevents the growth of disease germs. Thus sulphurous compounds are unnecessary and are only added when the fermentation diminishes. Sulphurous acid

fine considerable quality and by means of numerous comparative experiments it will be possible to limit or extend its use.

The writer points out the advantages to be derived from the use of select-ferments in connection with pure yeasts. The fresh fruity wines of eaujolais, as well as the Aramon wines from the South of France, much for this reason, will improve considerably when prepared by this method. The yeasts possessing a characteristic bouquet, like those of pagne, retain their quality in the presence of these selected ferments. The danger from a later fermentation in the bottle as in the case of sulphited wines does not exist with wines prepared by this method of fermentation.

Physico-Chemical Volumetric Estimation of Potash and Magnesia and its Application to Wines. — DUBOUX, M., in *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 159, No. 4, pp. 320-323. Paris, July 27, 1914.

M. Duboux proposes to extend the application of the electrical conductivity method (1) to the estimation of potash and magnesia, which had not been studied.

The potash is estimated in neutral solution after the addition of 18 times volume of 95 per cent. alcohol by determining the conductivities after successive additions of platinic chloride. Magnesium is determined by the degree of conductivity of the solution to which 0.02 per cent. of ammonia 0.06 per cent. of ammonium chloride have been added, induced by successive additions of a semi-normal solution of phosphoric acid. In estimating these substances in wines the organic matter must be previously removed.

The volumetric method gives results sufficiently consistent with those obtained by the customary gravimetric method, but generally about 0.01 per litre below them.

The Influence of Radioactive Emanations on Yeasts and Alcoholic Fermentation. — JACQUEMIN, G., and GRUREL, G., in *La Vie Agricole et Rurale*, Year III, No. 35, p. 232. Paris, August 1, 1914.

Radioactive emanations have a marked action on alcoholic fermentation and yeasts, exerting a stimulating action from the moment of inoculation of the medium and the growth of the elliptical yeasts until the later stages. The transformation of sugar is more complete and the yield of alcohol is greater by several tenths of a degree in most radioactive media. Radioactivity of $\frac{1}{2}$ to 1 unit per litre exerts a beneficial action on yeasts and accelerates the breaking-down of saccharine organic compounds, just as in the case of the mineralization of nitrogen by nitrifying organisms. The increased activity and alcohol-yielding capacity of radioactivated yeasts is of great advantage in many fermentation industries and notably in vinification.

¹ See article by P. DUTOIT and M. DUBOUX: "Analysis of Wines by a Physico-Chemical Volumetric Method". — *B.* Dec. 1912, pp. 2562-2569. Also, No. 247. *B.* Oct. 1914. (Ed.).

1054 - **Some Products of the Banana.** — *Queensland Agricultural Journal*, Vol. Part 1, pp. 40-41; Part 2, pp. 150-152. Brisbane, July and August 1914.

It has been calculated that in all exporting countries there are probably 8 000 000 bunches of bananas that annually fail to come up to the standard required by shippers. These 8 000 000 bunches, at 6 d each, amount to £200 000 per annum. This shows the importance of the problem of their industrial utilization.

The writer describes the methods of preparing dried bananas, "banana figs", banana meal, banana wine (obtained by the spontaneous fermentation of the fruit mixed with water, but which keeps only a short time), and banana alcohol or whisky. Bananas analysed by Comwinde showed that they contain as much as 22 per cent. of sugar, 16.1 per cent. of which is crystallizable; hence the conclusion that they may produce an excellent alcohol. At the Central Laboratory of Queensland experiments were conducted which led to the production of a good spirit something like whisky. Samples of this spirit that had been only a few months in the barrel were sent to the St. Louis Exhibition where they were much appreciated. The cost of manufacture is said to be much less than that of ordinary whisky. The yield may be estimated at about 1 gallon per bunch of bananas. The cost of a plant capable of producing 150 casks of whisky daily is estimated at about £34 500. This estimate includes buildings, machinery, apparatus, fuel, labour, administrative general expenses for two years, cases and bottles for one year and material for manufacture for two years, namely 270 000 bunches at 7 each.

1055 - **Studies on the Extraction of Olive Oil.** — VENTRE, JULES (École Nationale d'Agriculture de Montpellier) in *Annales de l'École Nationale d'Agriculture de Montpellier*, New Series, Vol. XIII, Part IV, pp. 249-269. Montpellier, April 1914.

I. — *Formation of the oil in the olive and its relation to the time of harvest and storage.* — Experiments were conducted to determine how far it is true that the yield of oil is increased by delaying the harvest of fruits. The results are set forth in Table I and show that the increase in yield of oil after maturity is only apparent, being due largely to loss of water by evaporation.

TABLE I. — *Composition of olives at various stages of maturity.*

	Date of gathering			
	November 15 unripe, skin of a yellow rose colour	December 3rd skin reddish	December 21 ripe and black not wrinkled	January end of season fruit shrivelled
Weight of one olive . . . gms.	1.685	1.650	1.615	1
No. of olives per litre . . .	350	392	420	458
Weight of 1 hl. kg.	58.975	64.680	67.830	69
Water in fresh olives . . . %	40.85	38.92	36.74	30
Oil in fresh olives %	17.2	20.85	24.16	25

In order to determine whether continued maturation on the tree enhances the formation of oil, batches of fruits were stored in a dry atmosphere from the 15th of November to the 10th of January. The percentage of oil was determined at three different periods during this time and results compared with the analyses of similar fruits gathered fresh from the trees at the same times as those taken from storage. The results are given in Table II.

TABLE II. — Comparison between the oil-content of fresh olives and stored olives at different stages of maturity.

Date of gathering or removal from storage	Stored olives			Fresh olives		
	Moisture % of fresh olives	% of oil in		Moisture % of fresh olives	% of oil in	
		fresh olives	dried at 105°		fresh olives	dried at 105°
November 15	—	—	—	40.85	17.2	29.1
November 3	33.23	22.64	33.92	38.90	20.85	35.15
November 21	23.6	28.42	37.20	36.65	24.16	37.60
January 10	20.62	30.48	38.40	30.92	25.63	37.12

It is seen that the proportion of oil to dry matter is sensibly the same in stored and freshly gathered fruits. On the 15th of November the olives contained 40.85 per cent. of water and on the 10th of January only 20.62 per cent.; by calculation from the 17.2 per cent. in the dry matter on November 15, the stored fruits should contain 23.32 per cent. on Jan. 10, while actual result obtained by analysis was 30.48, thus showing an increase of 7.16 per cent.

These results also show that harvesting the fruit too late diminishes the yield of oil. Olives may therefore be safely stored for a certain time provided they are placed in layers not exceeding 16 inches in thickness if the storeroom is kept ventilated.

Heated olives give a higher yield of oil. The best temperature is between 35 and 40° C. (95 and 105° F.) and is obtained by natural fermentation at the end of 6 to 8 days after storing according to the above conditions. Should spontaneous fermentation proceed too far, or if moulding appears, the oil will be acid and very inferior.

From these results the writer draws the following conclusions:

1. The yield of oil from olives increases from the beginning to the end of maturity, chiefly owing to the loss of moisture by evaporation and the consequent increase in the proportion of the other constituents.
2. The olive contains a sufficient quantity of reserve material to be transformed into oil during storage, and ripening may continue after harvesting the fruits as in the case of other fruits.

3. The best time for harvest is during the second and third periods of maturity, when the skin is red or black and without wrinkles.

4. Storage under rational conditions in no way endangers quality and maturation of the fruit for industrial purposes.

II. — *Comparisons of mechanical and hydraulic presses.*

The results of experiments with the hydraulic press are given in Table III. Treatment A consisted in subjecting the paste of olives ground half an hour on a small mill stone, to a maximum pressure of 260 000 lbs. maintained for 80 minutes. The oil thus obtained was of superior quality.

Treatment B consisted in subjecting the paste to a preliminary press of 150 000 lbs. for 25 minutes, after which the baskets were emptied and the paste placed in the finishing press, taking care to add 2 lit of warm water at 80-85° C. to each basket. The pressure was then raised to 260 000 lbs. for 55 minutes. The liquid of the different presses was collected separately; the first was of fine quality, the second had less agreeable dry taste.

Treatment C was exactly similar to the preceding, with the difference that the water used was at a temperature of 15° C. The separation of the watery layer was more rapid than in the preceding case and the second extraction was considerably improved; it was considered advisable to mix the two qualities of oil and obtain a unique product of superior quality. Treatment D differed from B and C in omitting the addition of any water to the pressed paste. The quality of the oil obtained at both presses was superior to that obtained by treatment B.

Treatment E was like treatment B, but the duration of the press was doubled, 40 minutes in the preliminary press and 80 minutes in the final press. The product obtained in this case was inferior to all the preceding.

Table III shows that the yields were almost equal by each method excepting the slight increases when water was added.

The use of cold water, which does not injure the product, should be neglected in large factories.

The experiments of which the results are summarised in Table IV were conducted in a mechanical lever press, with a pressure of about 167 000 lbs. The procedure was analogous to that of the preceding experiments; in A the pressure was maintained for 100 minutes, in B the pressure was applied for 1 hour.

Comparing Tables III and IV it is seen that the yield of oil from the first operation is greater with mechanical presses than with hydraulic, but the total yield of oil is greater from the latter.

The residues of the two series of experiments were analysed. Table V shows that the residues of the first series (hydraulic presses) contained in the average of the treatments 10.16 per cent. of oil (in terms of matter), whilst the residues of the second series (mechanical presses) contain 11.59 per cent.

It was observed during these experiments that the degree of grime

TABLE III. — *Experiment with hydraulic presses.*

		Treatment				
		A.	B.	C.	D.	E.
1st Pressure (preparatory).		—	14.95	15.1	14.8	13.05
2nd Pressure (final):						
a) without water		16.85	—	—	2.1	—
b) with warm water		—	2.50	—	—	2.35
c) " cold water		—	—	2.2	—	—
Total		16.85	17.45	17.3	16.9	17.40
% of total oil	1st Pressure	—	79.7	71.4	70.0	71.15
2nd Pressure		79.7	11.8	10.4	10.0	11.1
% of fresh olives		42.1	43.7	40.4	46.3	43.8

TABLE IV. — *Experiment with mechanical presses.*

		Treatment				
		A.	B.	C.	D.	E.
1st Pressure.		—	15.75	15.95	15.80	16.13
2nd Pressure:						
a) without water.		16.2	—	—	0.55	—
b) with warm water		—	0.85	—	—	0.72
c) " cold "		—	—	0.45	—	—
Total		16.2	16.60	16.40	16.35	16.85
% of total oil	1st pressure	—	24.47	25.36	24.7	26.20
2nd pressure		76.6	4.00	2.13	2.6	3.46
% of fresh olives.		59.9	54.4	57.1	54.3	53.4

essential importance with respect to yield of oil, and that if it is too low the yield is actually diminished.

The conclusions drawn from these experiments are:

1) Hydraulic presses are always capable of excellent returns, regard to both yield and economy of time.

- 2) Mechanical presses, when well made, can yield almost as results as hydraulic presses under certain conditions.
- 3) Hydraulic presses should be employed in large installations where the increased yield will compensate for their heavy expenditure.
- 4) Apart from the pressure, the addition of hot or cold water results in an increased yield.
- 5) As a general rule the yields obtained by the use of cold are about equal to those obtained by hot water.

1056 - **Some Data on Peanut Butter** (1). — Urr, C. A. A. (Kansas State Agricultural College, Manhattan) in *The Journal of Industrial and Engineering Chemistry*, No. 9, pp. 746-747. Easton, Pa., September 1914.

The writer analysed 23 samples of peanut butter bought on the market and found that the percentage of oil varied between 46.44 and 55.48. The refractive index at 25° C. ranged from 1.4680 to 1.4707 and the density from 88.76 to 94.36. He further prepared three samples of refined peanuts reduced to butter-like consistency and found their characteristics to be within the above limits. Another sample was prepared by roasting peanuts brown in olive oil and then grinding them as finely as possible. It was found to contain 55.48 per cent. of oil and its refractive index at 25° C. was 1.4620.

According to BEATTIE some fresh peanuts may contain as much as 50 per cent. of oil; after roasting the oil content would be higher and subject to a corresponding loss of water. The writer concludes that finding less than 50 per cent. of oil in peanut butter does not warrant its being declared adulterated by the addition of other oil. That added oil can be detected is seen in the lowering of the refractive index by the use of olive oil.

1057 - **The Japanese Seaweed "Tosaka Nori."** — COTTON, A. D., in *Royal Botanic Gardens, Kew, Bulletin of Miscellaneous Information*, No. 6, pp. 219-222. London, 1913.

Professors Cotton and Yendo have identified and named *Enteromorpha papulosa* the edible Japanese alga known in Japan as "tosaka nori" and which had been described under several other names. It is found in the Red Sea, and in the seas near Somaliland, Formosa, Japan, Guadeloup, and the Sandwich Islands. In Japan it is much esteemed. It is often collected by divers in a depth of 10-12 fathoms along open coasts in the northern and southern parts of the country. Large quantities of the plant are, however, obtained by picking up the floating fronds with a scoop after rough weather in early spring. The weed is dried in the sun and sold in the markets. It is prepared into isinglass and is used as a food. A certain amount is also exported annually to China, where it is known as "hong-tsai" (crimson weed).

(1) See No. 65, B. Jan. 1913.

Bacteriological Enquiry on Sterile Milk Sold in Brussels. — KOFFERATH, H., *Annales de Gembloux*, Year 24, Bk.8, pp. 417-424. Brussels, August 1914.

From the results of 17 samples the writer draws certain conclusions regarding milk sold as "aseptic" in Brussels. Comparing the results obtained from the use of aseptic milking with those already published on the same milk delivered in the city of Brussels, the progress made by dairies becomes apparent. The writer had found that the ordinary milk sold on an average contained 388 430 germs per cc., whilst in the 17 samples mentioned only 17 263 germs per cc. were found. These results show the importance of the establishment of official bacteriological control of milk supplies and the value of such a service to the public.

In the 17 samples examined, two were found to contain *coli* bacilli. The writer should be such that it may be safely consumed without boiling. It is therefore evident that the greatest care should be taken to observe all regulations.

The Belgian Permanent Milk Commission asked the writer to determine a maximum limit for the number of germs allowable in sterile milk. This limit should be about 50 000 germs per cc., estimated by counts on Petri plates kept for 3 days at a temperature of 38° C. At the same time various bacilli such as *coli* and tuberculosis germs must be allowed.

Payment for Milk and Cream Supplies. — CUDDIE, in *The Journal of Agriculture*, Vol. VIII, No. 3, pp. 295-299. Wellington, N. Z., March 1914.

While the purity of milk (that is the lowest possible content of micro-organisms) is of the greatest importance for making cheese and butter of very best quality, milk supplied to dairies continues to be paid according to fat content alone. As all the lots of milk are mixed up together the least pure lots reduce the best to a lower standard, and the injury caused only by the least careful dairies is felt equally by all.

The official inspection of milking sheds, yards, etc., has only a partial effect in raising the standard of purity in factory supplies. The writer therefore proposes that a reduced price per pound of butter-fat be paid for quantities of raw material which can yield produce of only indiffer-ent quality, and a premium be given for those deliveries which possess a high degree of purity.

In order to introduce such a scheme it would, of course, be necessary to classify the milk and cream from each farm by a competent independent officer, who would visit the factory for the purpose, not less frequently than once a week. The date of his visit should not be the same for all the suppliers.

A sample representative of the day's supply should be taken on the day of the officer's visit and submitted to the "curd test".

This test has been tried over a long period of years and has been found to be thoroughly reliable as an indicator of the purity of the milk, although it has not appeared to have ever been applied to the grading of milk for other purposes.

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The samples submitted to the grading officer for examination bear only a number and not the name of the owner. The grader will record his decision and hand a copy of his results to the secretary of the company concerned, who would credit each supplier with the grade recorded for that particular period. The number of days covered by this might be made coincident with the period covered by the test for butter fat, which would simplify the work.

The men selected to undertake the grading should be appointed by Government. If the work were properly organized, in most districts several neighbouring factories might agree to have the same inspectors, which would make the expense to each very moderate.

The writer is convinced that the adoption of the scheme outlined above would eventually raise the value of New Zealand butter and cheese by at least 3s or 4s per hundredweight. In fact the best New Zealand cheese exhibited at the last Dunedin Winter Show and then sent to London where it was placed on exhibition, was sold 4 to 5 s per cwt. more than New Zealand cheese was bringing on the market at the time.

1060 - **The Influence of Foot-and-Mouth Disease on the Composition of Milk Butter.** — BORDAS, F., and DE RACZKOWSKI, S., in *Annales des Falsifications*, No. 68, pp. 271-292. Paris, June 1914.

After giving a résumé of the question which has interested the chemists and magistrates appointed for the suppression of frauds (1), the writers furnish additional information for the solution of this problem. Their searches were made with samples of milk taken with all possible care in the presence of the local veterinary surgeon in places where foot-and-mouth disease had been reported. The results of the analyses of diseased milk and healthy milk from the same cowsheds have been compared with the analyses obtained the same day from milk collected throughout the district.

The changes in the composition of the milk and butter due to foot-and-mouth disease are as follows:

1) *Milk*. — A notable increase in the proportions of fat and salts, especially chlorides, and a decrease in the percentage of casein. There is apparently no change in the percentage of lactose, except that in the case of milks from cows in the height of fever and of those with abnormally high fat content there is a decrease in lactose accompanied by a corresponding increase in ash. The percentage of organic phosphorus and the percentage of solids-not-fat remain unchanged. Milks in which solids-not-fat fall below 86 gms per litre are rare.

2) *Butter*. — Examination of butter from a single badly diseased cow might lead one to suspect addition of about 25 per cent. of margarine. That from a herd of cows more or less infected would be suspected of addition of 5 to 6 per cent. The conclusions of the writers confirm those forwarded by French Analysts.

Thus, though it is true that the milk from a single cow or a small number of cows in the same shed, or that the butter obtained from a small quantity

(1) See No. 2783, *B. Aug.-Sept.-Oct. 1911*; No. 954, *B. Aug. 1913*.

infected milk may show an abnormal composition, the collected milk after butter centrifugalised from it never shows any defects such as would render them unsaleable.

- **New Observations on the Origin of the Taste of Swedes in Butter.** -- WEIGAND and WOLFF, in *Landwirtschaftliche Jahrbücher*, Vol. 46, Part 3, pp. 343-365. Berlin, May 15, 1914.

In the 37th volume of *Landwirtschaftliche Jahrbücher* one of the writers demonstrated that the taste of swedes in butter is to be attributed, for the most part, to bacterial action and only for the very least part to a somewhat rancid smell and taste of the cow than is found in ordinary milk. He has recognized that the bacteria which caused this secondary flavour are not new and special ones, but those which are generally found in milk, especially *Bacterium coli*, lactic acid bacteria, *Actinomyces odorifer*, besides the mycelia rarely found in milk.

Since the above publications the writers studied further cases of the taste of swedes in samples of milk and butter. It was first established that the swede flavour was due to strains of *B. coli* together with other species, among which is to be mentioned *Bacterium fluorescens liquefaciens*, which possesses to a great degree the power of producing the taste of swedes and carrots in milk. The observations on the latter taste were made on the occasion of investigating a milk which was designated as "bitter" and subject to "premature curdling", in which this bacterium was prevalent together with members of the *coli-aerogenes* group, short alkaline bacilli cocci. The glass plates on which the milk was laid smelt distinctly strongly of carrots, and the milk inoculated with the isolated bacterium took after 24 hours the same strong taste and smell.

The taste of swedes caused by *Bacterium fluorescens liquefaciens* is exceedingly acute and strong, and could be studied in a number of cases. On several occasions, when the above bacterium was present, instead of the defective taste a fine pineapple or strawberry flavour could be detected. In other instances the *Bacterium fluorescens* did not produce the swede taste alone but only in the presence of other bacteria, especially of lactic acid bacteria. The latter alone may even be the cause of the defective taste of the milk, from which it follows that they also are capable of producing the swede taste to butter. This is perhaps rather more a taste of "older", which becomes stronger and more distinctly swede-like as soon as other bacteria or fungi possessing similar properties are present.

In all the cases mentioned the writers have found bacteria which possess the power of producing such tastes and odours. It may thus be inferred that the substances giving these tastes and odours are due to properties of the bacteria acquired during their evolution, which properties the writers attribute chiefly to the nutritive medium or to the medium in which the bacteria live.

The experiments made, show that these odorous substances of the nutritive medium are partly directly transmitted and are partly due to the production of substances which do not exist in the nutritive medium but are formed from the components of the medium. It may be admitted

as certain that every group and species of bacteria has its specific action as to taste. Whether the same nutritive medium under the action of different bacteria gives rise to the same taste remains to be investigated.

1062 - **The Odessa Cattle and Meat Supply.** — *Daily Consular and Trade Review* Issued by the Bureau of Foreign and Domestic Commerce, Year 17, No. 13 pp. 1004-1005. Washington, August 21, 1914.

The Russian cattle industry is continuously declining and the meat producing centres are gradually receding to the outskirts of the country; nevertheless there is no scarcity of forage and the breeds are improving considerably, as has been shown by the recent livestock exhibition at Rostov. There were no oxen weighing less than 542 lbs. and some weighed as much as 1264 lbs.

During the last three years the following animals were slaughtered at the Odessa abattoir:

	1911	1912	1913
Cattle	132 566	119 397	125 474
Calves	26 522	25 412	26 343
Sheep	68 963	84 911	88 114
Lambs	46 935	43 159	53 368
Swine	41 825	53 924	61 797

Cattle and other animals intended for consumption must be killed and prepared at the city abattoir. Only such animals as have been inspected by its veterinary surgeons are allowed to be killed, and after slaughter the meat is again inspected as well as all prepared meat brought into the city. All meat intended for exportation must also be accompanied by a certificate from the veterinary of the National Government. A small quantity of meat is sent from Odessa to other Russian ports on the Black Sea.

The Odessa cattle market, the largest in South Russia, supplies many neighbouring towns and determines the prices of meat animals for a wide radius. In 1913 the following animals were brought to the Odessa market: oxen 39 965; cows, 48 286; heifers 76 464; calves 1556. Most of the cattle and meat supply of the city is brought from within a radius of 200 to 300 miles.

The following table shows the average wholesale prices per 100 pounds of various meats during the last three years:

Years	Beef	Veal	Mutton	Pork
1911	\$ 7.75	\$ 15.00	\$ 6.80	\$ 8.30
1912	8.00	15.75	8.55	8.90
1913	7.80	15.00	7.50	8.50

The retail price of beef has risen during the last seven years from 7.2 per lb to 11.1 cents.

In considering these prices it must be remembered that the animals are of improved breeds and that the method of cutting up provides a great saving with much waste.

Much attention is given to the treatment of by-products at the city abattoir. The blood is mostly dried and powdered. The entrails are chiefly for feeding swine and fowls. The intestines are worked up into sausage casings and musical instrument strings, and occasional small quantities are salted for export. Most of the fat is used in local industries, especially that of soap making, partly also in the manufacture of margarine. Some mutton fat is exported to Turkey. Hoofs and horns are for the most part worked up by factories in Central Russia. At all the hides go to local tanneries. The contents of stomachs are packed and carted to the Odessa irrigation fields, where they are ploughed into the poorest soils, which are a mixture of brackish sea sand and carried down by the rains.

When amply manured, treated with the city's waste waters and covered with salt, the ground is good for kitchen-garden produce.

- *The Wool Clip in Australasia in the Year 1913-1914.* (t) -- *The Agricultural Gazette of Tasmania*, Vol. XXII, No. 7, p. 254. Hobart, July 1914.

The number of sheep estimated to have been shorn in the Commonwealth of New Zealand in the season 1913-14 was 109 692 264 head, including 100 000 head of goats, and they produced 7.87 lbs. per fleece as against 7 lbs. for the previous season. An average monetary return of 6s 4d per head was obtained, the total value of the wool clip being £34 957 463. The exports of wool, plus the quantity retained for manufacturing purposes, give a total of 2 639 280 bales. The average sale price per bale was £13 4s 11d and the total amount of all the wool sold in Australia and New Zealand was 1 968 578 bales, while 10 years ago only 837 497 bales were sold. The increase in the value of the wool clip sold in Australasia in 10 years amounts to no less than 160 per cent.

¹ See also No. 837, *B.* July 1913 and No. 1119, *B.* Oct. 1913.

(Ed.)

PLANT DISEASES

GENERAL INFORMATION.

1064 - Decree of the Governor of the Colony of Eritrea, dated 13 July (No. 2026), concerning the Protection of Plants. — *Bullettino ufficiale della Colonia Eritrea*, Year XXIII, No. 29, pp. 221-222. Asmara, July 16, 1914.

Art. 1. - Proprietors and directors of horticultural establishments, nurseries in Eritrea producing plants, parts of plants and seeds, or engaged in their sale, are required to declare this to the regional commission.

The Colonisation Department has the right to inspect crops and vegetable products wherever they may be stored, and, if they are considered infected, to prevent their sale or order their disinfection.

Art. 2. — Officers acting under the instructions of the Director of Colonisation Department have the right of entry into all properties, irrespective of the crop or use of the land, to ascertain whether disease is present, and according to the provisions of this decree and special arrangements, they have the power to take the necessary steps for the disinfection and care of infected plants.

Art. 3. — The introduction of agricultural, forest and ornamental plants and parts of plants or seeds from Italy is forbidden, unless they are accompanied by a certificate indicating their origin and declaring them to be free from plant diseases liable to endanger the production of crops and useful wild plants in the Colony.

Art. 4. — The certificates referred to in the preceding article shall be signed by the Directors of the State Phytopathological or Entomological Stations or Laboratories, or by the Directors of State Institute of Agriculture or Experiment Stations authorised to grant such certificates.

Art. 5. — The importation of plants, parts of plants and seeds from foreign countries is in general forbidden. In exceptional circumstances the Colonisation Department will be able to grant special permission for the introduction of plants, parts of plants and seeds from foreign countries when certified to be free from dangerous diseases by competent persons appointed by the Department itself.

Art. 6. — Plants not considered free from diseases dangerous to the cultivation of crops or economic plants in the Colony will be destroyed without any compensation being allowed to the owner. The destruction of plants is placed under the charge of the Director of the Customs Office.

Art. 7. — Contraventions of this decree or of regulations to be published for the execution of the decree are punished by a fine of from 8s to without excluding more serious penalties for violations of provisions of the Italian Penal Code. Contraventions of the prohibition of importation and conveyance shall be liable to a penalty not less than 8s and not exceeding £ 12, without excluding more serious penalties for contraband.

Art. 8. — On the proposal of the Director of Colonisation, special decisions concerning the following matters may be published :

a) destruction of stubble and crop refuse liable to endanger the cultivation of other crops in the Colony;

b) prohibition of growing certain crops or of certain methods of cultivation liable to cause damage to cultivated or wild plants of economic value to the Colony ;

c) prohibiting cultivators from allowing plantations of trees to be infected if they are attacked by injurious parasites ;

d) enforcing definite treatment for the disinfection of plants, parts of plants and seeds introduced into the Colony ;

e) enforcing the use of remedies and the means of control against plant diseases, injurious insects and other plant pests, in cases in which the efficacy of the above measures depends upon the cooperation of all interested, in cases of neglect to observe these orders, the carrying out of the necessary treatment at the expense of the defaulters.

Art. 9. — Special decrees will be introduced concerning the publication of provisions which may be required for the control of specially injurious pests or for the more effective protection of special crops.

DISEASES NOT DUE TO PARASITES OR OF UNKNOWN ORIGIN.

5 - **The Contortion and Breaking of Wheat Straw.** — DARNELL-SMITH, G. P., in *The Agricultural Gazette of New South Wales*, Vol. XVI, Part 5, pp. 377-378, 1 fig. Sydney, 1914.

In several districts of New South Wales, especially at Nyngan, Wagga and Cowra, it has been observed that wheat is subject to a malformation twist of the stem as though its normal development had been restrained. The stem is thus weakened and is liable to be broken by the wind when the grain is ripe. In some cases this is so common that the crop appears to have been trampled under foot.

The natural strength of the straw does not appear to have any considerable influence on the prevalence of this phenomenon. In explanation has been suggested as being caused by insect attacks and also by disproportionate growth of the stems.

Similar cases were also recorded at Carrathool and Denitiqui in 1900, and in the former place it was said to be caused by the bites of aphides during the early stage of growth.

Examination of the diseased straws in 1912-13 did not show the presence of any insect or fungus disease, nor were aphides found on the wheat at Nyngan, Wagga or Cowra in 1914.

According to Maiden, the Government Botanist, who examined several stems, the centre of the disturbance is situated near the lower nodes of the stem. He also remarks that a similar phenomenon has been described as "contortion" by Masters and according to him it is generally produced by retarded growth in certain directions or abnormal growth in others.

Unfortunately, neither attacks of aphides nor abnormal growth due to irregular rainfall admit of the application of remedial measures.

BACTERIAL AND FUNGOID DISEASES.

1066 - **Parasitic Fungi collected in the Straits Settlements and Fiji Islands.** Royal Botanic Gardens, Kew, *Bulletin of Miscellaneous Information*, 1914, No. 4, pp. 156-159. London, 1914.

Among the 11 species enumerated, the following described by Massee as new to Science are worthy of mention from a phytopathological point of view: 1) *Cyphella Heveae* collected in Province Wellesley on the bark of *Hevea brasiliensis* and undoubtedly parasitic on this plant; it is allied to *C. villosa* Karst.; 2) *Botrytis necans* observed in the Botanic Garden at Singapore on the larvae of *Brachistonia catoxantha* (Lepidoptera), which is effectively kept in check thereby; 3) *Cercospora Musae* parasitic on the leaves of bananas in the island of Viti Levu (Fiji). It is considered to be the cause of a serious disease in estates in the Sigatoka district. Infected leaves fall early: generally the lowest leaves are attacked first and the disease spreads upwards.

1067 - **The Presence of the Hybernating Mycelium of *Macrosporium Solani* in Tomato Seed.** — MASSEE, I., in *Royal Botanic Gardens, Kew, Bulletin of Miscellaneous Information*, 1914, No. 4, pp. 145-146, 1 plate. London, 1914.

It has long been suspected that the spores of "black rot" of tomato (*Macrosporium Solani* Cke.) were contained in the seeds, but the actual presence of the fungus had not yet been demonstrated. When the fruit are attacked by the fungus the seeds show black spots on their surface. In 1906 G. Massee showed that the plants derived from such infected seeds were often attacked by "black stripe" disease of the stem due to *M. Solani*. Microtome sections of these spotted seeds show the presence of the mycelium of the fungus.

In a healthy tomato seed, the external integument is in intimate contact with the endosperm, whilst in an infected seed there is a thick layer of hyphae between the two.

In the case of badly damaged fruits the mycelium extends below the diseased zone and in many cases the placentas are completely invaded by a thick web of mycelium, which renders them quite black. The seeds attached to these placentas are often attacked by the mycelium, which penetrates the micropyle. The web of mycelium sometimes forms a uniform layer round the endosperm; in other cases it is of variable thickness only represented by local patches. The hyphae extend from the periphery to the endosperm and also to the embryo, probably dissolving the cell-walls by means of a ferment. When the end of a hypha comes in contact with a cell-wall, it flattens and swells, a small portion of the centre then penetrates the cell-wall and swells out on the other side to its normal size. In other cases the penetration of the hyphae is effected without flattening and swelling out. No haustoria are found.

On the germination of infected seeds, the embryo is destroyed almost immediately by the mycelium if it is present in quantity, or the mycelium continues to grow in the tissues of the young plant where it may easily be found. Infected plants show the "black stripe" disease before they are two months old, if grown under favourable conditions for the growth of the fungus. Sections of diseased seeds which had been kept dry for several months became surrounded by a mass of mycelium when placed on damp filter paper in a Petri dish, thus showing that the mycelium retains its vitality for a considerable time inside the seed. In numerous cases when the seed from a diseased fruit does not contain mycelium in its interior, it is surrounded on the exterior by a web of mycelium which cannot be removed by the ordinary processes of cleaning, since it is held in position by the thick layer of hairs on the seed-coat.

This external mycelium is therefore a source of danger. The only certain means of avoiding the disease is by rejecting all seeds produced from diseased fruits, even those which do not show black spots.

165 - The Resistance of Different Varieties of Gooseberries to American Gooseberry Mildew (*Sphaerotheca mors-uvae*) and the Effect of Treatment with Sulphur. (1) — KÖCK, G., in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Österreich*, Year XVII, Part 6-7, pp. 634-637. Vienna, 1914.

RESISTANT
PLANTS

During 1913 the writer had the opportunity of studying the resistance of American gooseberry mildew (*Sphaerotheca mors-uvae*) of some hundred varieties of gooseberries, at Eisgrub (Bohemia). The effect of sulphuring with "Ventilato") was also observed.

This rich collection of gooseberries was examined on July 15th and it was found that of the red varieties the following were attacked by the disease: Chain Red, Drum Major, Guido Red, Overall, Raspberry and Roaring Lion (or Rote Preisbeere); on the occasion of a second visit on August 5th, Monstrueuse (or Rote Preisbeere) was found to be diseased. Of the green varieties the following were infested on July 15th: Duke of Bedford, Green Walnut, Keepsake, Plain Long Green, Smiling Beauty

(1) See also No. 884, *B.* July 1913; No. 1301, *B.* Nov. 1913; No. 183, *B.* Feb. 1914. (Ed.).

(Hellgrüne Samtbeere). The following yellow varieties were found diseased on July 15th: Globe Yellow (or Runde Gelbe) and Rockwood, while Yellow Lion was found diseased on August 15th. The only white variety attacked was Queen Mary.

Sulphuring caused leaf-fall in the following 56 varieties:

Aaron, Alexander, Antagonist, Apo lo, Britannia Red, Chain Red, Champagne Yellow, Companion, Conquering, Hero, Drum Major, Duckwing, Fleur de Lys, Frühe Weisse, Früh von Neuwied, Green River, Grosse Rauhe Rote, Guido Red, Husbandman, Industry (or Triumphbeere), Jaune Rouge, Jolly Miner, Jolly Printer, Keen's Seedling, Large Hg Leveller, Liberator, Migolez (or Red Walnut), Minima, Monstrueuse, Mount Pleasant, Oakmere, Overseer, Pitmaston Green, Plattrunde Himbeerstachelbeere, Pride, Primo Orange, Prince Regent, Printer, Queen Caroline, Raspberry, Roaring Lion, Rockwood, Rose of Sharon, Rough Red, Sämling von Maurer, Sämling von Pausner, Sampson, Shannon, Smiling Beauty, Smith's Improved, Smooth Yellow, Teazer, Twigem, White Champagne, Yellow Eagle, Yellow Lion.

The following varieties resisted infection:

- 1) *Red*: Alicant, Alexander, Britannia, Bloodhound, Companion, Forester, Grosse Rote, Industry, Jaune Rouge, Jolly Miner, Jolly Printer, Keen's Seedling, London, Migolez, Octavius Brown (Dans Mistake), Plattrunde Himbeerstachelbeere, Rough Red, Rose of Sharon, Sämling von Maurer, Twigem, Wonderful (Braunrote Riesenbeere), Ironmonger.
- 2) *Green*: Balloon, Aaron, Bumper (Rockwood), Emerald (Smaragdbeere), Früheste Neuwied, Green Willow (Grüne Flaschenbeere), Green Yellow Seedling (Golden Lion), Green River, Independent, Jolly Angler (Grüne Riesenbeere), Lovely Anne, Lofty (Grüne Riesenbeere), Nettle Green (Dünnschalige), Pitmaston Greengage, Smith's Improved, Thum Frühe Weisse Hebbun, Green Prolific, Lady Delamere.
- 3) *Yellow*: Britannia, Catherina, Conquering Hero, Champagne Yellow, Duck Golden Yellow (Marmorierte Goldkugel), Höning's Früheste (Früheste Gelbe), Husbandman, James Dawson Yellow, Liberator, Leveller, Lord Ranccliffe, Minima, Prince of Orange, Printer, Rumbullion, Reveller, Smooth Yellow, Sampson, Triumphant, Two-to-one, Te Yellow Eagle, Mount Pleasant, Stella.
- 4) *White*: Antagonist, Apollo, Date, Eagle, Fleur de Lys, Large Hairy, Prim, Queen Caroline, Sämling von Pausner, Shannon, White Lion, White Champagne, Whitesmith.

The following showed no leaf-fall after treatment with sulphur:

- 1) *Red*: Alicant, Bloodhound, Forester, Over-all, Octavius Brown, Ironmonger.
- 2) *Green*: Balloon, Bumper, Emerald, Green Willow, Green Yellow Seedling, Green Walnut, Independent, Jolly Angler, Keepsake, Lovely Anne, Lofty, Nettle Green, Primo Long Green, Thumper, Duke of Bedford, Green Prolific, Lady Delamere.
- 3) *Yellow*: Britannia, Catherina, Globe Yellow, Golden Yellow, Höning's Früheste, James Dawson Yellow, Lord Ranccliffe, Rumbullion, Reveller, Triumphant, Two-to-one, Stella.
- 4) *White*: Date, Eagle, Primrose, Queen Mary, White Lion, Whitesmith.

The observations concerning the disease resistance of each variety and the action of sulphur on the leaves will be continued.

On the Composition of Alkaline Bordeaux Mixtures and their Soluble-Copper Content. V. MOREL, V., and DANT NY, E., in *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1914, 2nd Half-year, Vol. 159, No. 3. pp. 266-268. 1914

MEANS
OF PREVENTION
AND CONTROL

According to some authorities, the insoluble copper exists in Bordeaux mixture in the form of hydrate: according to others it is also present in the form of basic sulphates and double sulphates of calcium and copper. Work was carried out to determine the conditions of formation of these compounds and to determine whether alkaline mixtures are more soluble copper.

It was found that acid mixtures, apart from the free copper sulphate, consist almost entirely of the basic sulphates of copper of green colour. The exclusion of the hydrates of copper, whatever their mode of preparation. The precipitate has no immediate action on neutral solutions of copper sulphate.

Further, experimenting with exactly determined equal proportions of copper sulphate and lime, it is possible to produce two alkaline mixtures of different colour, one being blue and the other green. On adding an excess of a solution of copper, the blue hydrates or green basic sulphates are produced according to the rapidity with which the lime is added in. When hydrates are formed, they consist chiefly of the hydrate of Pélégot.

The quantity of copper in solution in blue alkaline mixtures, valued as copper sulphate, may reach 23 gms. per hl., but it diminishes on keeping. Besides copper thrown out of solution, green alkaline mixtures contain both copper and copper compounds in solution; the proportion of copper valued as copper sulphate reaches 41 gms. per hl. but diminishes on keeping.

It follows that alkaline mixtures, contrary to the general opinion, do not contain some copper in soluble form; and this amounts to about 10,000 times the amount required to prevent the germination of the spores of *Plasmopara viticola*. Consequently the objections to this mixture are justifiable.

Potato Diseases in Victoria, Australia. — BRITTELBANK, C. C., in *The Journal of the Department of Agriculture of Victoria, Australia*, Vol. XII, Part 7, pp. 400-403. Melbourne, 1914.

BACTERIAL
AND FUNGOID
DISEASES
OF VARIOUS
CROPS

Since 1911, Victoria has, so far, been fortunate in not having to record any of the more serious diseases affecting potatoes in Europe and other countries. The only new disease, and one possibly of minor importance, is a commonly known as "dry scab" (*Spondylocladium atrovirens*). Neither the "corky or powdery scab" (*Spongospora subterranea* [Johnson]) nor "black wart disease" (*Synchytrium endobioticum* [Wall]) has yet made its appearance in this country. The former, however, has been detected in two separate shipments of potatoes from the United States, both being confiscated and destroyed.

From the serious nature of these diseases it would be as well, before it is too late, to prohibit totally and absolutely the importation of potatoes from Victoria from countries beyond the Commonwealth. Varieties suitable for the climate could be raised within the State, from seed either im-

ported from abroad or raised here. By adopting this course the danger of introducing either of the above diseases would be minimised.

During the past three years, examination of the consignment of potatoes from various countries, revealed the universally diseased condition of the tubers. Not a single consignment was free from disease.

Following diseases were found to occur in one shipment alone: *Spizopora subterranea* (Wallr.) Johnson, *Phytophthora infestans* De Bary, *Botrytis Solani* Kühn, *Spondylocladium atro-virens* Harz, *Fusarium sporium* Schlecht., *Oospora Scabies* Thaxt., *Bacillus Solanacearum* E. F. Smith.

1071 - Fungus Diseases of Hevea in the Belgian Congo. — VERMOESEN, in *Revue agricole du Congo belge*, Vol. V, No. 2, pp. 312-321. Brussels, 1914.

During a stay at Bakusu, Coquilhatville, in the Belgian Congo, in January 1914, the writer examined the Hevea plantations for fungus diseases.

Only a single case of root-disease was found; probably the free from disease of the roots was due to the plantations being on a deep, drained, sandy soil, as well as to the fact that the land was almost wholly cleared of trunks and stumps, which favour the spread of *Fomes semitostus* and other root parasites: it should be noted that this *Fomes* was found on two stumps.

The "die-back" disease of branches and trunk is very widespread at Bakusu. In the nurseries the damage is slight, only the tips of the branches being attacked generally, though in exceptional cases the main stem may be killed. The worst damage is just after planting out, when many trees succumb. In older plantations it is chiefly the younger trees which are attacked, the result being weakening of the tree.

The disease normally appears at the tips of the green branches, which it works its way towards the base of the stem. On the stem it appears a pale brown patch bounded by a sharp line, while the wood is blackish grey. The infection often stops when it reaches the junction of a larger branch and almost always at the trunk. On old branches the disease is recognized by the loss of the leaves, in conjunction with change of colour of the wood. The fruiting-bodies of the fungus causing the disease also appear: it is probably referable to *Diplodia cacao*, which attacks Hevea, cacao, etc., in various tropical countries.

A few other parasites of no practical importance were noted, a fungus near *Hypocrella* and an alga (*Cephaleuros*) on the leaves, and *Uromyces* sp. and a fungus belonging to the Hysteriaceae on the twigs.

Root-disease should be combated by burning all wood infected with *Fomes semitostus*, as well as stumps and dead branches. Care should be taken not to spread infected earth about, and after an infected tree has been removed the earth should be turned over to expose it well to the sun; lime may be added if obtainable; in any case fresh trees should not be planted for five or six months.

"Die-back" may be dealt with by spraying the young trees in the nursery with Bordeaux mixture; infected twigs or trees should at once be burnt. Older plantations should be gone over at least every two months to cut out infected wood. Vegetable tar should be applied to all wounds.

Fungus Diseases of Cacao in the Mayumbe, Belgian Congo. — VERMOESEN. in *Bulletin agricole du Congo Belge*, Vol. V, No. 1, pp. 186-202, figs. Brussels, 1914. These diseases are divided into four groups:

a). *Root diseases.* — They are very rare, only two or three very trifling cases having been observed. This may be attributed to the distance to root-diseases possessed by cacao and the fact that the first no plantations in the Mayumbe have been made on partially cleared stand in which the trees were not all cut down, so that the soil is not covered with numerous trunks and dead stumps which favour the development of root parasites.

b). *Trunk disease.* — The chief external symptoms are a yellowing sudden and simultaneous drying of all the leaves and twigs of the bush. Often the disease spreads to the roots. On removing the bark of a diseased tree large blackish spots are seen; these extend irregularly, but chiefly in a longitudinal direction and on the death of the tree more or less completely surround the trunk. The diseased condition of the wood extends inwards to a variable depth (up to $1\frac{1}{2}$ inches). It does not necessarily extend completely round the trunk at a given height, but extends the whole length of the tree in the form of irregular spots which collectively extend round the circumference of the trunk. Further examination of the surface of a stripped tree during the early stages of the attack (on the yellowing of the leaves) shows the presence of small galleries traced by insects and corresponding to the position of the spots. These insects attack healthy vigorous trees independently of the fungus, and they are always present on diseased cacao plants, even during the last stages of the disease.

If a diseased tree is left in a damp shady place for a few days the characteristic spores of a *Diplodia*, probably *D. cacaoicola*, appear in large quantities on the trunk and branches. Microscopical sections of the black spots show the presence of myriads of hyphae of a brown mycelium to which the black discoloration of the diseased areas is due.

It is more than probable that the above-mentioned insects become infected with the viscid *Diplodia* spores which are so abundant on the dead branches, decomposing fruits and especially refuse pods, and introduce them into their galleries in the bark of the tree, thus causing infection.

To control this disease the writer recommends in the first place that diseased trees should be cut to the surface of the ground without delay. On the appearance of the first symptoms of the disease; then the cut surfaces should be coated with a layer of vegetable tar. Attention should also be given to the clearing up of all rubbish, such as dead or useless trees in plantations. Where it is not practicable to burn the empty cocoa pods they should be buried with lime.

c). *Diseases of the branches.* — Canker disease is caused by the punctures of *Sahlbergella singularis* (Hemiptera). "Red rust" is due to an alga, *Malvastrum virescens*, which causes the premature fall of most of the leaves. This is especially prevalent in situations exposed to the sun. There are other less serious diseases of the branches and leaves.

d). *Diseases of the fruits.* — There are several different kinds of diseases caused by *Phytophthora Faberi*, *Diplodia cacaoicola*, or an undetermined *Colletotrichum*: the latter fungus develops more rapidly on fruits attacked by *Sahlbergella singularis*.

1073 — **Damage caused by *Marssonia Rosae*, in the Roseries near Lyons**
CHIFFLOT, in *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, 2nd Half-year, Vol. 159, No. 4, pp. 336-338. Paris, 1914.

As a result of observations of rose gardens in the Lyons district, valuable contributions to our knowledge of *Marssonia Rosae* (Bon.) Br. et al. (Melanconiaceae) have been obtained, and it has been realised that this fungus is a more serious pest than was formerly believed.

Not only is the leaf-blade liable to attack as early as June, but the petiole, stipules and stem are liable to be attacked by the fungus. Further, the disease appears towards the end of September on the flower beginning at the base of the sepals, petals and stamens. Although formerly regarded as a leaf-parasite, this fungus may attack all the aerial organs of a plant, especially in certain less resistant varieties. Further, the mycelium though generally considered as subcuticular, may penetrate into the parenchyma of the leaves and the woody tissues of the stem. It appears that the mycelium is persistent and that it is possible that budding infected trees will spread the disease.

Although the fungus is difficult to destroy, it is not impossible to prevent the attack. Infected leaves should be removed and burnt with fallen leaves. After pruning, the soil and the branches should be sprayed with either Burgundy or Bordeaux mixture or copper acetate, the latter in the proportion of $\frac{3}{4}$ lb. to 1 lb. in 10 gallons of water. The addition of 1 oz. of gelatin previously dissolved in 1 quart of warm water improves the adhesive power of the solution. This treatment has given excellent results near Lyons; the prevention of defoliation thus obtained is favourable to the ripening of the wood and the formation of fruits.

1074 — **Field Studies on the *Endothia* Canker of Chestnut in New York State**
RANKIN, W. H., in *Phytopathology*, Vol. 4, No. 4, pp. 233-260, figs. 1-2, plate 1. Baltimore, Md., 1914.

These experiments were conducted in temporary field laboratories located at Highland, New York and Napanoch during 1911-13.

In 1911 the disease was abundantly widespread east of the Hudson as far north as Albany and made the greatest ravages along the state line between New York and Connecticut. West of the Hudson River the disease had not advanced as far north. In Albany County the disease was only general in the southern part. A few spot infections were found in southern Delaware County along the Delaware and Susquehanna Rivers. One spot infection was found at Masonville, Delaware County, and destroyed. No infections were known west of this region in 1911.

In 1913 the strip along the Delaware River was found to be abundantly affected where previously only isolated spots were found. The disease does not appear to be spreading as rapidly north as west and no infections were found in Otsego County.

In the inoculation of lenticels, glass rings were fixed to the branches by grafting wax so as to maintain a proper humidity for spore germination on the bark. The enclosed bark was then sprayed with a suspension of ascospores in water and the ring sealed with a coverglass. Eleven inoculations were made and in no case was infection accomplished, but every case of wound inoculation produced cankers.

Attempts to obtain inoculation through natural cracks in the bark were also unsuccessful. It is therefore reasonable to conclude that the fungus is not able to penetrate healthy tissue as single hyphae, but when recent dead tissue is present to afford the fungus a chance to form the radial fans it invades the living tissues.

Mycelium from pure cultures, bits of affected bark, conidial spores, pycnidia from wood, and conidia and ascospores suspended in water, are all capable of producing infection when introduced into open wounds in the bark.

The fact that infection cannot be obtained in old wounds such as old tunnels is unexplained as yet. Possibly partial callus development and suberisation of the exposed tissue accounts for it.

As a general rule the primary infection of healthy trees takes place in smaller branches and usually in limbs towards the top or outside of the crown where they are more or less exposed.

Numerous inoculation experiments have shown that two and three year old branches remain susceptible to the disease throughout their growth period, whilst first year shoots are immune during the spring and are exposed to infection during the summer.

No infection is possible through the midribs of the leaves. No difference in susceptibility between young and old bark was noticeable, except in the case of the present year's growth during the spring, nor was any seasonal variation observed in the degree of susceptibility. Cessation of growth of the mycelium in the bark during winter, as well as negative results of inoculation at this time of the year, is explained purely on the basis that the temperature is too low for the vegetative activity of the fungus. The healthiest and most vigorous trees are as susceptible as slow growing, half-dead or otherwise injured trees. Drought and frost do not appear to affect the tree's resistance to the disease and there does not appear to be any relation between the water content of the bark and the rate of growth of the mycelium. Such variations as occur may be explained by other environmental factors, mainly temperature.

Of morphological interest is the development of a form of pycnidium without stroma which is often found on the wood beneath the loosened bark and on the cut ends of stumps and logs.

Other morphological characters of the fungus and the ejection of spores are also dealt with.

1075 - Two New Wood-destroying Fungi: *Fomes putearius* and *Trametes setosus*. — WEIR, JAMES R., in *Journal of Agricultural Research*, Vol. II, No. pp. 163-167, plates IX-X. Washington, D. C., 1914.

The writers gives the systematic description of two new Polyporaceae *Fomes putearius* and *Trametes setosus*. The former is closely related *Fomes conchatus* (Pers.), which is always found on the wood of deciduous trees, especially oaks and willows (*Salix* spp.), and which has not yet been reported on wood of conifers nor been collected in the West. Several collections at hand from southern Germany are all on the wood of broad-leaved trees. *Fomes putearius*, on the other hand, always occurs on coniferous wood: *Pinus ponderosa*, *Pseudotsuga taxifolia*, *Picea Engelmannii* with a preference for larch (*Larix* spp.). The rot produced is one of the most conspicuous found in the northwestern forests and is similar to that produced by *Trametes pini* Fries., but the reduction of lignin is on a much greater scale. The fungus was first collected in the Kaniksu National Forest, near Priest River, Idaho. It is distributed throughout the Northwest and is most abundant in the white pine zone.

Trametes setosus is chiefly parasitic on *Pinus monticola* and occurs occasionally on the wood of other trees, but always on conifers. *Polyporus gilvus* Fr., which seems to be the nearest relative and is usually found on the wood of deciduous trees, has not been collected in the West. *T. setosus*, on account of its abundance, causes serious damage to valuable merchantable timber in forest-fire areas. The chemical action of the mycelium on the wood is to reduce the lignin principally in the sapwood, leaving a cellulose ring alternating with sound autumn wood, which causes the annual rings to separate. It was also first obtained in the above mentioned forest of Idaho and it is distributed throughout the white pine (*Pinus monticola*) belt of the Northwest; specimens have been collected in all the principal forest areas from Vancouver, B. C., to Montana.

INSECT PESTS.

— The Life Cycle of *Sitona lineata* in Germany. — MOLZ, E., and SCHROEDER, in *Zeitschrift für wissenschaftliche Insektenbiologie*, Vol. X, Part 8-9, pp. 273-275. Berlin: Schöneberg, 1914.

The pea-weevil (*Sitona lineata* L.), which is recorded as particularly injurious in England, should also be classed among the dangerous insects in Germany.

During 1913 the Experimental Station for plant diseases at Halle received notification of 14 occurrences of the insect causing damage by devouring the edges of leaves of leguminous crops; seven outbreaks were on peas, two on beans, two on lucerne, and one each on haricot beans, vetches and clover. One case was also recorded on chicory.

The writers have observed the larvae towards the end of April and the adults towards the end of May. In the open, according to information received, the adults appear in April and May as well as in July and August.

appears therefore that the beetle is double-brooded in Germany as in Poland.

In order to reduce the damage in the larval stage which occurs on ory and beets in April, it is advisable to sow later in districts liable to cks. Since the larvae begin to pupate at the end of April and beginning of May the larval stage will be almost completed before the plants ear. It is also desirable to make a thicker seeding in the infested areas.

- **The Preparation of Lime-Sulphur Solution.** — *The Agricultural Gazette of Tasmania*, Vol. XXII, No. 7, pp. 255-257. Hobart, 1914.

The Sub-Committee on Fruit-Culture of the Department of Agriculture of Tasmania, after careful examination, recommends the following formula for concentrated lime-sulphur solution (in parts by weight): 50 lime, 100 pure sulphur, 500 water. (1) They also recommend dilutions of 1 in 7 (about 14 per cent.) for winter spraying of fruit-trees, 18 (about 3½ per cent.) for summer spraying of deciduous trees, and 20 (5 per cent.) for citrus trees (2).

- **The Practical Efficiency of Food Traps in the Control of Vine Moths (*Conchylis ambiguella* and *Polychrosis botrana*), and the Presence of the Vine Pyralid (*Oenophthira pilleriana*) in Piedmont.** (3) — TORRI, M., in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di scienze fisiche, matematiche e naturali*, 1914, 2nd Half-year, Vol. XXIII, Part I, pp. 15-18. Rome, 1914.

MEANS
OF PREVENTION
AND
CONTROL

Attempts to catch the moths of *Conchylis* and *Polychrosis* in the spring by means of vessels containing a fermenting sugary liquid made at Bel Colle (prov. Alessandria), had met with little success. The writer therefore repeated his experiments in the summer from July 9 to August 5, using earthenware vessels containing fermenting liquids at each of the four corners of a vineyard of about an acre in area surrounded by other yards; water was added every few days to the pots to make up the loss from evaporation.

At the end of this period 10 *Conchylis*, 73 *Polychrosis* and many other insects, including 2 *Oenophthira*, were caught in the liquid. This method does not appear to be favourable to trapping the last-named moth, which would probably be more attracted by lamp-traps.

From July 18 to August 11 F. Monticelli experimented with two vessels, one containing strong vinegar diluted with water and the other with wine equally diluted; he placed them beside a large vine growing on the espalier system against a wall in the town. All the moths captured belonged to *Polychrosis*; 7 were caught in the vinegar and 20 in the sweet wine. A large number of Hymenoptera were drowned in the liquids, the most being in the vinegar.

(1) This is the same as the formula recommended by the Citrus-growing Station of Trapani (Sicily): see No. 753, *B.* April 1912. (Ed.).

(2) Cf. No. 753, *B.* April 1912; No. 1245, *B.* Aug. 1912; and No. 317, *B.* April 1913. (Ed.).

(3) See also No. 969, *B.* Oct. 1914.

This and recent experiments made in France show that liquids with alcoholic fermentation are the most suitable for the capture of the moth. Considering the small number of insects captured in a district with a large area under vines and the large number of food traps and the expense required to carry out the method effectively, as well as the fact that good results can only be obtained by cooperation of all the growers, the writer does not recommend this as a practical means of control. It is, however, valuable as an indicator of the most suitable time to commence operation with insecticides against the larvae.

In studying the development of the broods, thin active larvae of *Polychrosis* 8 to 9 mm. long and stumpy lazy larvae of *Conchylis* of the same length were found during the beginning of June. The vine was in full flower in the middle of June. As is well known the summer pupation takes place in the most diverse places; the pupae are however, rarely found in the places preferred as a winter refuge, but more frequently in the bunches and in leaves spun up by *Oenophthira*. At the beginning of July, the first adults of the second brood are on the wing; all the adults collected, belonging chiefly to *Polychrosis*, were males; it is therefore certain that in this species the males appear before the females.

Large numbers of larvae of *Oenophthira* were noticed in certain places near Alice Bel Colle, though the damage up to the present has not been very important. This is attributed to the abundance of parasites, especially Tachinids, but it is possible that the moth may become very injurious in certain years.

1079 - *Euxesta chavannei* and its Relation to the Sugar Cane Disease caused by *Bacillus Sacchari*, in the Province of Tucuman, Argentine. — BEZURE JEAN, in *Bulletin de la Société entomologique de France*, 1914, No. 2, pp. 37-38, 111 Paris, 1914.

This article contains a description of the new species *Euxesta chavannei* (Diptera), which, according to the collector M. JEAN CHAVANNE, causes the decomposition of the young shoots of the sugar cane and prepares the way for the entrance of the disease known as "polvillo" caused by *Bacillus Sacchari* Speg.

This species is allied to *E. acuta* Hend. and *E. argentina* Brèthes.

1080 - *Sahlbergella singularis* and other Pests on Cacao in the Mayumbe Belgian Congo. (1) — MAYNÉ, R., and VERMOESEN in *Bulletin Agricole du Congo Belge*, Vol. V, No. 2, pp. 261-281, figs. 110-116. Brussels, 1914.

Sahlbergella singularis Hagl. is the most active and most dangerous pest in cacao plantations in the Mayumbe. It appears in abundance twice a year, viz. at the beginning of the rainy season (October-November) and towards the end of this period (April-May). There are also other less numerous broods throughout the rainy season.

This insect is most active at night and the effects of its punctures are according to the organ attacked. In the case of fruits a small vitreous-blo-

(1) See also No. 1072, B. Nov. 1914.

dark green spot appears immediately after the insect has made the puncture; this spot then becomes surrounded by an opaque border of a brownish colour, which gradually spreads over the spot; the surface then becomes raised, and as the spot develops the edges take on a pale orange colour, the centre turns black.

The damaged tissues grow more slowly than the surrounding healthy tissues, producing cracks, which are soon invaded by fungi or insects, which produce complete rotting of the fruit or cankers.

On the green branches the spots are at first like those on the fruits; generally they are elongated and much depressed; frequently the tip of the shoot dies.

On the lignified branches the punctures develop into longitudinal cankers, which become more numerous as the branch grows and expose the xylem vessels. These wounds may soon heal of themselves, or they may girdle the branch owing to successive attacks of the insect or to the intervention of other insects or fungi.

If the attack is serious, the trees gradually lose their leaves and also a greater part of their lateral branches. Sometimes even the larger branches dry up completely.

Other Hemiptera causing similar cankers are: *Helopeltis* sp. (on the leaves and rarely on the twigs); *Atelocera serrata* Westw. (common on the leaves) and two undetermined species (rarely on the fruits).

The fungi which cause the rotting of wounded fruits are: *Phytophthora* *ri* Maubl. (at present rare), *Colletotrichum incarnatum* Zimm. and *Diplodia* *canicola*; on decomposing fruits two species of *Nectria* have also been observed, one allied to *N. Bainii* Massee, with *Fusarium* sp., etc. Following have been found on the branches: *Diplodia*, *Colletotrichum* and various undetermined Ascomycetes, and besides *Fusarium* sp. other Ascomycetes, one of which probably belongs to the genus *Tubercularia*. A combined wash of Bordeaux mixture and petroleum emulsion is recommended for the control of *Sahlbergella* and the other insects and fungi. Wounds should be dressed with vegetable tar, since coal-tar causes a marked sterility of the branches. Burning of twigs, branches and dead trees lying in the plantations is also recommended.

- **Insects injurious to Tobacco in Hawaii.** — FULLAWAY, D. T., in *Hawaii Agricultural Experiment Station, Bulletin* No. 34, pp. 20 + 9 figs. Washington, 1914. An account of the principal insect pests of tobacco in Hawaii with reference to their distribution, biology, habits, means of control, natural and artificial, etc.

I. Insects attacking the plant.

a) *Caradrina reclusa* is the most common of the "cutworms" in the islands and is known locally as "peelua". This moth was probably introduced a short time ago from Fiji and is now one of the most serious pests. It is often necessary to replant the crop six or seven times, on account of the general distribution of poisoned baits and hand picking. One of the difficulties of the control of the insect is due to the rocky nature of the soil, making it difficult to work. After thorough cultivation of

the soil, the best artificial means of control consists in the spread of poison baits amongst the plants (white arsenic or Paris green mixed with moistened and sweetened bran, flour, or middlings). The edges of fields adjacent to uncultivated land are often trenched, so as to present a steep surfl on the exposed side which the cutworm cannot climb. Handpicking is sometimes resorted to, but is altogether too slow and expensive. Amongst their natural parasites are: *Frontina archippivora*, *Chaetogaedia monticola*, *Ichneumon koebeleri*, *Trichogramma pretiosa* (1) and several birds, which should be protected and increased in number by importation.

b) *Phthorimaea operculella* (2), or common Gelechiid moth, was first noticed in Hawaii in 1892. The grub (tobacco splitworm) mines the leaves of its host plants, making a broad, flat track through the mesophyll between the upper and lower epidermis, which often becomes torn and split and shattered when dry.

It is most injurious to seed-bed plants and considerably retards their growth, so that sturdy seedlings for transplanting are difficult to obtain. This trouble is partly overcome by seeding the beds very thinly and protecting them with cotton netting. The damage on well-conducted plantations is generally confined to the two or three poor soiled lower leaves. In neglected plantations however the disease becomes general.

The grubs can be destroyed by dusting arsenate of lead on the plants in the seed-bed when they are emerging through the epidermis to form their burrows. The arsenic may also be applied as a spray combined with Bordeaux mixture. Under field conditions this treatment is of little value and very expensive. As a precaution against general infestation no solanaceous plants should be grown near the tobacco fields and all solanaceous weeds in the immediate vicinity should be periodically destroyed. The most common parasites of this pest are *Chelonus blackburni* and *Limneria blackburni*.

c) *Heliothis obsoleta* (3), the tobacco pod-borer, or cotton boll-worm injures the tobacco plant chiefly by boring the seed pods and to some extent devouring the foliage. In Hawaii it is never found on either corn or cotton and is not generally considered a serious pest of tobacco. It is best checked by topping the plants as soon as the flowers appear, and when it is desired the flower stalks are enclosed in a bag. Neglected fields always show signs of the borer and if for any reason a field of standing tobacco is abandoned, the plants should be ploughed up and destroyed to avoid general infestation. The eggs of this moth are probably parasitised by *Trichogramma pretiosa*, though it is not recorded as being actually taken from *Heliothis* eggs in Hawaii. It is possible that it is also attacked by the common tachinid parasites.

d) *Phlegethontius quinquemaculata* (4), or hornworm, is extremely

(1) See also No. 438, B. April 1913.

(2) See also No. 1117, B. July 1912.

(3) See also No. 2584, B. Aug.-Sept.-Oct. 1911; No. 627, B. June 1913 and No. 1118, B. Sept. 1913. (Ed)

(4) See also No. 1118, B. Sept. 1913. (Ed)

common and has never been seen by the writer on cultivated tobacco. It is sometimes found near Honolulu on the wild tobacco (*Nicotiana glauca*), which it soon defoliates.

If it were to appear in tobacco fields it could be checked by spraying with lead arsenate (3 lbs. to 100 gallons of water), to which the young are very susceptible. Large worms should be hand picked, as it is difficult to kill them with a stomach poison. Its natural enemies are not known, but there is probably an egg parasite.

e) *Epitrix parvula*, or tobacco flea-beetle, is of recent introduction to Hawaii. Both larvae and adults cause damage, especially the latter, by piercing holes and breaking up the margins of the leaves. It is more common and injurious in neglected plantations, especially in the neighbourhood of other solanaceous plants.

In growing tobacco commercially it is necessary to exercise care and to remove all plants to remain after the tobacco has been picked. Other solanaceous crops and weeds in the neighbourhood should be periodically sprayed. When the insect causes damage the affected plants may be sprayed with arsenate of lead, 1 lb. to 20 gallons of water, or half this strength if the arsenate is in paste form.

f) *Minor pests*: the larvae of *Plusia chalcites* and *Amorbia emittella*; *Pseudococcus citri* and *P. virgatus*; *Siphanta acuta* and *Pulvinaria psidii*; *Elmoea appendiculata* and *Xiphidium varipenne*; *Nysius vinosus* and *Xyleborus* sp.

II. Insects affecting the stored product.

Lasioderma serricorne, or cigarette beetle, is very injurious and was first observed in Hawaii in 1885. It is generally destroyed by fumigation with carbon disulphide or hydrocyanic-acid gas. This method gives admirable success where the infestation is only incidental and local and infested material can be placed in a tight compartment so that the full strength of the gases can be utilised. When the infestation becomes general, in warehouses in which stored products are being continually handled, it is exceedingly difficult to control the beetle. The only means is a systematic fumigation of the whole warehouse from time to time, or different parts of it which can be rendered tight against the diffusion of the gas. It is sometimes a distinct advantage to spray the walls and floors with kerosene or kerosene. Manufactured goods are often kept in cold storage to prevent beetle injury, and if not removed too soon the danger of injury after withdrawal is greatly reduced. It has, however, been shown that at low temperatures continued for long periods are not sufficient to destroy the vitality of the eggs. A species of *Pteromalus* has been obtained as a natural parasite of this beetle.

2 - Peach Tip Moth injurious to Peaches and other Fruit Trees in New South Wales. — FROGGATT, WALTER W., in *The Agricultural Gazette of New South Wales*, Vol. XXV, Part 5, pp. 413-414, 3 plates. Sydney, 1914.

Four or five years ago it was noticed in the suburban gardens and in many orchards between Sydney and the mountainous region, that the ends of young branches of peaches and nectarines were attacked by certain small

larvae which pierced one side of the shoots and bored a cavity inside towards the base, causing the drying up of the leaves and the exudation of gum at the tip of the damaged shoot. Sometimes all the branches of the tree were damaged in this manner and an otherwise healthy tree would show tufts of dead leaves at the ends of its branches.

Later developments showed large quantities of the fruits with numerous pustules covered with a gummy secretion under which insects destroyed the epidermis.

Examination of a few specimens showed the damage to be due to a larva of a small *Tortrix*, which has not yet been identified, but which resembles the codlin moth (*Carpocapsa pomonella*) in its larval and adult forms. The damage to the surface of the fruit is more serious than that to the branches, since large scars are formed on the unripe fruits, which then become unfit for sale.

After describing the life-history, the writer mentions that the larvae cause considerable damage in the neighbourhood of Sydney, not only to peaches, but also to other fruits such as apples and quinces.

As a protection, the peaches should be thoroughly sprayed with an arsenate of lead at the beginning of summer and after the appearance of the first damage. In gardens and small orchards straw-banding the trees is recommended.

1083 - The "Leaf Case Moth" (*Hyalarcta hübnéri*) injurious to Fruit Trees in Victoria. — FRENCH, C. (JUNR.), in *The Journal of the Department of Agriculture, Victoria, Australia*, Vol. XII, Part 5, pp. 294-297. Melbourne, 1914.

The "Leaf-Case Moth" has recently been recorded as doing considerable damage to apples, quinces, vines, etc.

The larva has the habit of detaching portions from different fruits, thus rendering a large quantity unserviceable. It also eats the epidermis of the leaves, giving the tree a scorched appearance. The grubs appear to have a distinct preference for the young buds, and as many as 50 may be present on one tree the damage is considerable. Native trees such as the "tea tree" (*Leptospermum*), eucalyptus and other imported plants (pines and cypress) are attacked with avidity by the larvae, though it appears to prefer fruit trees.

The larvae adorn their exterior protective sheath with portions of the leaves upon which they are feeding. If a half-grown larva is transferred to another tree it changes its old covering of leaves for the new leaf.

Another closely allied species, *H. nigrescens* Doubl. (ribbed or bag moth) causes damage to eucalyptus, but it has not yet been found on fruit trees.

H. hübnéri is easily destroyed by means of spraying with an arsenate of lead.

1084 - Insect Pests of Citrus in Ceylon. — RUTHERFORD, A., in *The Tropical Agriculturist*, Vol. XLIII, No. 1, pp. 49-50. Colombo, July 1914.

The leaf-miner (*Phyllocnistis citrella*) is described in detail. The caterpillar of this Tineid moth mines underneath the upper or the lower

is of the young leaves, thus causing them to curl up. The mines also run underneath the epidermis of the young twigs. The mine often begins at the midrib, runs towards the base of the leaf, where it takes one or two turns, runs alongside the margin and takes one or two turns and then reaches close to where it began. The course of the mine is marked out by a narrow band of brownish frass and the mine itself has a silvery appearance. Not infrequently 4 or 5 caterpillars may be present in a single leaf. The caterpillars are subject to the attack of small, black Chalcids, but, however, are unable to keep them in check. Were the attack detected early enough a spraying with tobacco extract might do some good. The mine is usually finished before the casual observer's attention is drawn to it. The citrus grower should make himself acquainted with the first symptoms and be on the look out for them.

Sometimes the folded leaves are subsequently tenanted by mealybugs (*Pseudococcus* sp.), which continue the injury; but these are less numerous in Ceylon than in many other countries. Here, they are attacked by various enemies, the two chief being the caterpillar of the cecidomyiid, *Spalgis epius* West., and a Cecidomyiid (*Diadiplosis coccidiifera* Felt.).

A moth very similar to that of the leaf-miner was reared by the writer from leaves of *Melia Azedarach*, but the pupa showed several points of difference.

Other insects that have been observed or recorded recently as doing more or less damage to citrus trees in Ceylon are:

1) *Waltheriana* sp. This large coccid encrusts the stem and branches and is heavily parasitised by an Agromyzid, *Cryptochaetum curtipenne* Mab. The scale is attended by a species of *Cremastogaster*, but the two do not succeed in deterring the *Cryptochaetum*. 2) *Coccus viridis* Green, or "green bug". 3) *Lepidosaphes beckii* Newm. infests the fruits and leaves, causing the latter to crumple. 4) *Toxoptera* sp., an aphid found occasionally on young shoots, but not sufficiently numerous to cause damage. 5) *Tetranychus mytilaspidis* Riley; a mite closely resembling *T. bimaculatus* occurs on the leaves, causing them to become yellow. 6) *Aphis comosa* Kav., Melolonthid beetle reported as eating the leaves.

Occasionally, from fruit that has fallen prematurely, small bright-eyed weevils emerge. These are Drosophilids, whose habit is to lay their eggs in fermenting material. The fruit falls from some other cause and the flies probably infest it as it lies on the ground.

85 - *Otiorrhynchus sulcatus* attacking Vines in the Ile d'Oléron, France. — RIGOTARD, MARCEL, in *Journal d'Agriculture pratique*, 1914, Vol. II, No. 29, p. 94. Paris, 1914.

The vines in the Ile d'Oléron have been attacked by *Otiorrhynchus sulcatus* F., which appeared for the first time in 1913. The centre of infection is in the communes of Saint-Pierre, Saint-Georges, Dolus and Le Château.

The adult weevil devours the buds and shoots of the vines and the larva feeds on the roots of this and other plants (strawberry, raspberry,

peach, etc.). The damaged roots may succumb to their injuries, and shoots whose tips are repeatedly damaged are short and knotty cannot be pruned properly.

Of the various methods of control, the simplest and most efficacious consists in collecting the adults in traps consisting of tufts of grass, or dried leaves, exposed at the base of the vines and inspected daily. A local syndicate collected as many as 90 lbs. of insects in two weeks this method, and it requires about 7 000 insects to weigh 1 lb.

